A reflective process for analysing organisational resilience to improve the quality of care

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A REFLECTIVE PROCESS FOR ANALYSING ORGANISATIONAL RESILIENCE TO IMPROVE THE QUALITY OF CARE

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Doctor of Philosophy in Nursing Research

Abstract

Background

The Resilience Analysis Grid (RAG) is an approach to analysing organisational resilience based on the idea that four abilities (responding, monitoring, learning and anticipating) underpin resilient system performance (Hollnagel, 2010). Although the RAG has undergone some rudimentary methodological development, it requires significant further elaboration and testing.

Research Questions

How can the RAG be further developed to provide a replicable context specific process?

How can the views of healthcare staff be incorporated for analysing organisational resilience?

Methodology

A constructivist epistemology informed an exploratory sequential mixed method research design with nursing staff on an Acute Medical Unit (AMU) in a large, inner city London teaching hospital.

Phase One

This qualitative element of the study used focus groups to explore nurses' everyday clinical work. Eighteen nurses took part in nine focus groups, with two to five participants in each focus group. A thematic analysis found that the nurses work was extremely complex, and that social interaction facilitated their adaptations.

Phase Two

This quantitative element of the study used a cross-sectional survey design, with survey items directly informed by the thematic analysis of the focus group data, to explore the views of 77 nurses on the AMU about how well the system could respond, monitor, learn and anticipate. The results showed the nurses thought the AMU was most effective at responding and least effective at monitoring.

Phase Three

This qualitative element of the study used semi-structured interviews with seven nurses to reflect on the survey results and explore system level interventions to improve the potential for resilient performance. The nurses provided detailed insights into the survey results and suggested high-level interventions for improving the potential for resilient system performance.

Discussion

This thesis advanced the RAG by developing a replicable process for healthcare professionals to analyse the organisational resilience of their healthcare systems. It also showed the resilience engineering theoretical perspective can be used to engage healthcare professionals to analyse the organisational resilience of their healthcare system and work towards interventions for quality improvement. The main limitations were the findings were restricted to a nursing population, the lack of evaluation, the limited findings on quality improvement and the lack of Patient and Public Involvement (PPI).

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Abbreviations

Abbreviation	Meaning	First Use
ABMS	Agent Based Modelling and Simulation	p.69
AMU	Acute Medical Unit	p.14
CARe	Centre for Applied Resilience in Healthcare	p.29
CDU	Clinical Decision Unit	p.80
CRT	Critical Response Team	p.102
ED	Emergency Department	p.80
FCM	Fuzzy Cognitive Map	p.44
HRO	High Reliability Organisation	p.15
MDT	Multi-Disciplinary Team	p.140
NEWS	National Early Warning Score	p.102
NIC	Nurse in Charge	p.81
NHS	National Health Service	p.15
NT	Numerical Taxonomy	p.60
PCA	Principal Component Analysis	p.60
RAG	Resilience Analysis Grid	p.13
RE	Resilience Engineering	p.13
RHC	Resilient Healthcare	p.28
RMF	Resilient Markers Framework	p.51
SB	System Brittleness	p.67
SR	System Resilience	p.67
WAD	Work as Done	p.26
WAI	Work as Imagined	p.26

Chapter 1 – History of Safety in Healthcare

1.1 Overview of thesis

This thesis is about using a resilience engineering theoretical lens to analyse and improve the safety of healthcare systems. The resilience engineering field is conceptually well developed but lacks empirical testing and methods for using it in practice. This thesis advances the Resilience Analysis Grid (RAG) by developing and implementing a replicable, context specific process for healthcare professionals to analyse and improve the organisational resilience of their healthcare system. The findings of the thesis show the resilience engineering theoretical perspective can be used to effectively engage healthcare professionals to analyse the organisational resilience of their healthcare system and work towards interventions for quality improvement.

The primary research questions are high-level exploratory questions, guiding the thesis towards responding to the limitations of the RAG identified in the narrative review. The secondary research questions unpack the high-level exploratory questions with more specific questions to be answered.

The primary research questions are:

How can the RAG be further developed to provide a replicable context specific process?

How can the views of healthcare staff be incorporated for analysing organisational resilience?

The secondary research questions are:

What is Work-As-Done for nurses?

How can nurses' Work-As-Done be understood in terms of the four resilience abilities?

How can the development of responding, monitoring, learning and anticipating survey items be informed by accounts of Work-As-Done?

How can the results of applying the RAG inform quality improvement?

To answer these research questions, this study used a constructivist epistemological lens to inform a mixed method study design, with three research phases. It was conducted with nursing staff on an Acute Medical Unit (AMU) in a large, inner city London teaching hospital. An initial qualitative phase used focus groups to explore how nursing staff manage the complexity of their everyday clinical work. Then, a quantitative phase used a cross-sectional survey design, with survey items directly informed by the thematic analysis of the focus group data, to explore the views of the wider nursing population on the AMU. A final qualitative phase supported nursing staff to reflect on the survey results and identify potential system improvements.

This first chapter provides an overview of safety in healthcare and identifies how resilience engineering theory offers a response to the limitations of the current healthcare safety paradigm. The second chapter is a narrative review of methods for analysing organisational resilience in healthcare, which identifies the Resilience Analysis Grid (RAG) as the most promising approach for analysing organisational resilience. The third chapter presents the methodology of the thesis, introducing the theoretical underpinning and mixed method research design. The fourth, fifth and sixth chapters introduce the development and implementation of a three-stage reflective process for analysing and improving the potential for resilient performance of a healthcare system. Finally, chapter seven discusses the contributions of the thesis to the resilience engineering field and the limitations of the methods used.

1.2 Safety in Healthcare

Safety is the one of the most important dimensions of quality for delivering healthcare (Singh, 2014; Kohn et al, 1999). However, around one in ten patients still experience harm in healthcare systems around the world (Vincent et al, 2001) and understanding how to improve the safety of healthcare systems remains a challenge. Current approaches to understanding and improving

the safety of healthcare systems have had limited effect and some researchers suggest progress appears to have stalled (Braithwaite et al, 2015; Hollnagel et al, 2015). This chapter briefly explores the history of safety in healthcare to understand its origins, achievements and current limitations. Resilience engineering (RE) theory is then introduced as an alternative paradigm for understanding the safety and quality of performance in healthcare systems. This theoretical perspective focuses on understanding the complexity of everyday work and suggests that adaptations are necessary for maintaining effective system performance (Hollnagel et al, 2006; Hollnagel et al, 2015).

Healthcare safety is defined as the avoidance, prevention and amelioration of adverse outcomes or injuries resulting from healthcare processes (Vincent, 2010). Today, healthcare safety is a distinct discipline with a systematic focus on understanding and improving the safety of systems and reducing harm to patients (Emanuel et al, 2008). Healthcare systems are increasingly complex due to advancements in knowledge and technology, treatments and diagnostic techniques, ageing populations and increases in chronic health conditions (Shojania & Panesar, 2014). This makes healthcare safety more challenging than ever before. Although healthcare safety is a global endeavour, this thesis focuses on healthcare safety from the perspective of the National Health Service (NHS) in the United Kingdom.

1.2.1 A Brief History of Safety in Healthcare

Relative to the history of healthcare, it is only recently that safety has become an explicit focus of healthcare systems (Kohn et al, 1999; Donaldson et al, 2000). The healthcare safety movement has been shaped by many influences, including reflections on the nature of human error (Reason, 1990), studies on the extent of clinical error (Brennan et al, 1991; Wilson et al, 1995; Vincent et al, 2001), the subsequent move to systematically improve the quality of care across healthcare systems (Kohn et al, 1999; Donaldson et al, 2000), high-profile cases of healthcare failings (Walshe, 2001; Walshe, 2003; Sinclair, 2000; Douglas et al, 2001), development of High Reliability Organisations (HRO) in other high risk industries (Reynard et al, 2009) and the development and application of the human factors discipline in healthcare (Catchpole, 2014).

Before this explicit focus on the safety of healthcare systems, the prevailing attitude was acceptance of the inherent harm of healthcare practice and that quality was a normal outcome of dedicated work by capable healthcare professionals (Vincent, 2010). Adverse outcomes were viewed as inevitable, but unfortunate consequences of delivering healthcare. However, from the late 1800s this began to change as a series of influential clinicians, such as Florence Nightingale, conducted individual studies and produced isolated reports investigating things that went wrong in healthcare (Vincent, 2010; The Healthcare Foundation, 2013b). These reports and studies shaped a wider understanding that poor quality and adverse outcomes could be inherent to the structures and processes of a healthcare system itself (Vincent et al, 2013).

Reports of medical injuries and medication errors intensified from the 1960s through to the 1980s (The Health Foundation, 2013b; Chung & Custer, 2017) However, it wasn't until Brennen et al's 1984 retrospective study of patient records in New York that the scale of the problem of preventable adverse events became more widely recognised (Reynard et al, 2009). A series of large retrospective case studies followed in Australia in 1992 (Wilson et al, 1995), Denmark in 1998 (Schiøler et al, 2001), New Zealand in 1998 (Davis et al, 2002), UK in 1999 (Vincent et al, 2001), Canada in 2000 (Baker et al, 2004) and France in 2002 (Michel et al, 2004). They formed part of a growing body of evidence that around one in ten patients experienced some form of adverse event whilst receiving healthcare. Crucially, they showed that many adverse events were the results of human error and were therefore largely preventable (Leape, 1994). By today's standards, this is flawed thinking (Hollnagel et al, 2015). It wasn't until later that understanding of humans' roles in accidents changed, from viewing human actions as the cause of errors, to understanding humans as part of a wider complex system, the components of which interact in ways that lead to positive and negative outcomes (Hollnagel, 2016a).

On a similar time line, a series of high-profile cases brought healthcare failings to the attention of the media, the public and wider political discourse (Smith, 1998). An early example of this is the unexpectedly high number of deaths from infant cardiac surgery at the Royal Bristol Infirmary in the NHS, between the late 1980s and early 1990s, which had a mortality rate almost double that of other NHS hospitals (Morris, 2001). The subsequent inquiry is one of the first reports to use a systems approach to analyse what happened. The outcome of the inquiry shows that poor performance and errors are more than the result of individual actions but are the products of

systems that are not working (Treasure, 1998; Walshe & Offen, 2001). Similar high-profile cases of healthcare failings in the NHS include the deaths of nineteen elderly patients from food poisoning in 1986 and serious breaches of security at Ashworth High Security Hospital from 1995 to 1996 (Walshe, 2003). There are similar cases in other healthcare systems around the world; such as unexpectedly poor paediatric cardiac surgery outcomes in Winnipeg, Canada in 1994 (Sinclair, 2000), and a series of repeated complaints in King Edward Memorial Hospital in Perth, Australia through the 1990s (Douglas et al, 2001). These high-profile healthcare failings around the world increased public awareness of variability in the quality of healthcare systems and began to challenge the notion that quality is a natural consequence of the hard work of healthcare professionals (Emanuel et al, 2008).

The publication of the reports *To Err is Human* (Kohn et al, 1999) and *An Organisation with a Memory* (Donaldson et al, 2000) is seen by many as catalysts for the global patient safety movement (Shojania & Panesar, 2014; Chung & Custer, 2017). These reports moved discussion of safety in healthcare from a series of individual reports and high-profile failings to the forefront of public, professional and political discourse and have fundamentally changed the way safety is regarded in healthcare (Emanuel et al, 2008). One of the primary aims of *To Err is Human* was to establish patient safety as a compulsory activity of healthcare organisations, by developing national programmes, improving reporting systems and driving safety in clinical practice by involving healthcare professionals, regulatory agencies and the public (Kohn et al, 1999). This was a call for a systematic approach to patient safety across all elements of healthcare systems. On the other hand, *An Organisation with a Memory* recognised the unique complexity of healthcare systems, which combine processes, technologies and human interactions (Donaldson et al, 2000). It acknowledged that understanding safety means moving beyond human error and examining the deeper, system factors that affect clinical work in healthcare organisations. The report suggested this can be done by improving how performance data are collected, analysed, and used to improve healthcare systems (Donaldson et al, 2000). There was a clear message that modernising the way the NHS learns from things that go wrong should include unified mechanisms for reporting and analysing adverse events, developing a more open culture for learning and improving mechanisms for implementing lessons into practice.

An Organisation with a Memory has a strong focus on learning from other high-risk industries, which had already successfully transformed their approaches to safety with well-established safety practices and powerful external regulators (Vincent, 2010). These high-risk industries, such as aviation, nuclear power and the petrochemical industry experienced a series of large-scale industrial accidents in the 1970s and 1980s, such as the Tenerife aircraft accident in 1977, the Chernobyl nuclear disaster in 1986 and the Piper Alpha oil rig explosion in 1988 (Reynard et al, 2009). These disasters were costly because of lives lost, physical damage to property, financial losses, damaged reputations and environmental damage (Reynard et al, 2009). In response, these high-risk industries developed more sophisticated systems approaches to understanding and improving the safety of their operations (Reynard et al, 2009; Shojania & Panesar, 2014). Decades of detailed investigations in domains such as aviation and nuclear power showed that major accidents are often the result of a combination of minor mishaps, inadequacies and errors that happen throughout large complex sociotechnical systems (Macrae, 2014). This continued dedication to improving the safety of their operations informed the development of High Reliability Organisations (HRO) theory. The hallmark properties of these organisations are preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience and deference to expertise (Weick & Sutcliffe, 2001). These properties represent an overarching attitude to strive for increasingly safer system performances (Dekker, 2016). Since the 1990s some HROs have managed to achieve a zero rate for major accidents over many consecutive years (Reynard et al, 2009).

A common criticism of HRO research is that there are rich descriptions informing understanding of HRO processes in very specific contexts, however little is known about the extent to which these processes are transferable to wider organisational contexts (Waller & Roberts, 2003; Leveson et al, 2006; Lekka 2011). For example, one of the primary sources of understanding HRO processes comes from observations of work on a U.S. naval aircraft carrier (Hopkins, 2007). It is unclear how relevant these organisational processes are to a healthcare context. The theory underpinning HRO, High Reliability Theory, is just one theoretical perspective attempting to understand performance in complex sociotechnical systems. It can be contrasted with Normal Accident Theory (NAT), which maintains that accidents are inevitable in complex organisations that operate high-risk technologies (Perrow, 1984; Sagan, 1995). Despite the apparent success of HROs and the underpinning High Reliability Theory, this theoretical perspective does not yet

have solutions to the challenges of maintaining safe performances in complex sociotechnical systems. The patient safety literature makes regular references to HRO processes (Pronovost et al, 2006; Lekka, 2011; Tolk et al, 2015). However, there is little evidence of HRO processes being successfully translated into healthcare settings (Lekka 2011).

In response to the publication of these foundational safety reports (Kohn et al, 1999; Donaldson et al, 2000), there have been concentrated efforts to improve the safety of healthcare systems across the NHS (Vincent, 2010). There has been a dramatic shift from viewing error as the result of individual actions, to recognising the wider system impacts on healthcare professionals' activities (Macrae, 2014; Hollnagel, 2016). Learning has been established as an essential component of healthcare safety (Kohn et al, 1999; Donaldson et al, 2000). To this end, learning systems were introduced at national and local levels across the NHS, for example the National Reporting and Learning System was introduced in 2001 to capture all adverse events reported in the NHS in England and Wales (The Health Foundation, 2013b). The first incident was reported in 2003 and by 2013, nine million incidents have been reported (The Healthcare Foundation, 2013b). Over the years safety initiatives have become increasingly sophisticated, as research and practice have developed (Vincent et al, 2013). For example, in 2008 the World Health Organisation Safe Surgery Checklist represented a systematic global effort, with evidence-based interventions, to improve the safety of surgical interventions and reduce adverse outcomes (The Health Foundation, 2013a).

There has been almost two decades of explicit focus on improving the safety of healthcare systems. However, the healthcare industry is still some way off reaching similar levels of improvement to the safety of operations as other high-risk industries, such as aviation and nuclear power, have achieved (Hudson, 2003; Vincent, 2010; The Health Foundation, 2013a). In 2013, the findings from a public inquiry into the catastrophic failings in the standards of care at Mid Staffordshire NHS Foundation Trust, raised many concerns about the safety of the healthcare systems (Francis, 2013). Crucially, the recommendations in response to these failings suggested that healthcare providers needed to focus on the continual reduction of harm by embracing an ethic of learning, abandoning blame as a tool and embedding the voice of patients (Berwick, 2013). So, thirteen years after the publication of *An Organisation with a Memory,* healthcare has

continued to struggle with effectively implementing learning systems to improve the safety of healthcare systems.

The influential reports *To Err is Human* and *An Organisation with a Memory* galvanised the global healthcare safety movement. This focused work in healthcare systems around the world to improve the way safety is discussed, measured and improved (Vincent, 2010). There has been a dramatic shift from viewing error as the result of individual actions, to recognising the wider system impacts on their activities. A lot of the work in healthcare safety has borrowed from other high-risk industries, but healthcare has not yet demonstrated similar levels of improving the safety of system performance.

1.2.2 Limitations to Current Safety Approaches in Healthcare

The current healthcare safety paradigm has well established methods for understanding errors and adverse events, such as morbidity and mortality conferences, autopsies, case analysis, root cause analysis and error reporting systems (Thomas & Petersen, 2003). However, there is growing concern that progress has appeared to stall (Shojania & Panesar, 2014). Despite the calls to action from *To Err is Human* and *An Organisation with a Memory*, the patient safety movement has not made as much progress as anticipated (Hollnagel et al, 2015). Despite decades of work attempting to reduce the rate of adverse events in healthcare systems around the world, it remains largely unchanged (Kellogg et al, 2017). Some suggest that the slow progress is an indication that current methods are not sufficient for understanding the complexity of modern healthcare systems (Hollnagel et al, 2006).

'Never Events' are serious, largely preventable patient safety incidents that should not occur if existing national guidance and safety recommendations are implemented by healthcare providers (NHS England Patient Safety Domain, 2015). An example of a Never Event is the misplacement of a Naso/Orogastric tube (National Patient Safety Agency, 2010). Table 1-1 shows the number of Naso/Orogastric tube misplacements per annum since the advent of Never Events in 2009 to the most recent information available in 2018.

Table 1-1 Number of Naso/Orogastric tube misplacements from 2009 to 2017

Year	Number of Naso/Orogastric tube misplacements
01/04/2009 to 31/03/2010	41
01/04/2010 to 31/03/2011	Unable to find data
01/04/2011 to 31/03/2012	23
01/04/2012 to 31/03/2013	9
01/04/2013 to 31/03/2014	16
01/04/2014 to 31/03/2015	10
01/04/2015 to 31/03/2016	40
01/04/2016 to 31/03/2017	26
01/04/2017 to 31/01/2018	21

(National Patient Safety Agency 2010, NHS England Patient Safety Domain Team 2013, NHS England Patient Safety Domain Team 2014, NHS England Patient Safety Domain Team 2016, NHS Improvement 2017b, NHS Improvement 2018b, NHS Improvement 2018c).

Although the definition of Never Events and the way they are reported and measured has changed, which makes comparisons across years difficult, Table 1-1 illustrates that there was an initial reduction in the frequency of the misplacements of Naso/Orogastric tubes between 2009 and 2012. Then, from 2012, there has been a relatively stable number of these events and they continue to happen regularly. Many things could explain the fluctuating frequency of this Never Event, for example the changing definitions, changing reporting methods or increases in reporting. Despite the system barriers, repeated staff training and clear national policy about this, Naso/Orogastric tubes continue to be misplaced. The concept of Never Events, the way they are measured and their incidence and prevalence across the NHS is an example of the limitations of current approaches to understanding and improving safety in healthcare.

Patients continue to be put at risk of harm, and health care organisations are struggling to learn effectively from past experiences to improve the safety of delivering healthcare (Sujan et al, 2017). There is growing consensus that lessons learnt through current methods for analysing adverse events, such as root cause analysis, are not based on a holistic understanding of the context of the clinical work in complex healthcare systems (Hegde et al, 2013). Changing the guidelines or protocols in response to a root cause analysis just changes the way in which the healthcare professional will adapt to the guidelines in the future (Hegde et al, 2013).

The progress of the global patient safety movement has been much slower than anticipated (Pronovost et al, 2011). The calls to action from *To Err Is Human* (Kohn et al, 1999) and *An Organisation with a Memory* (Donaldson et al, 2000) effectively galvanised healthcare systems across the world to adopt more systematic approaches to healthcare safety. However, since then global efforts at understanding and preventing adverse outcomes have shown limited effect. There are still high-profile cases of healthcare failings around the world, with little evidence to suggest that repeated inquires and subsequent recommendations have lasting impact (Vize, 2016). Some suggest there is a need to adopt another way of thinking about safety in healthcare systems because current methods have not produced the intended effect (Hollnagel et al, 2015).

There may be other explanations for the unexpectedly slow progress of the global patient safety movement. Rather than inadequacies of the methods themselves, the problems might lie with the lack of expertise and experience implementing them. There is growing recognition that an immature science of safety and quality makes measurement and evaluation of progress difficult in healthcare (Pronovost et al, 2011). Previously, the implementation of patient safety initiatives, whilst having face validity, have often been poorly evaluated and their effects were not always well understood (Shekelle et al, 2013). For example, studies of some practices that have strong perceived benefits, such as implementing rapid response teams, have yielded conflicting results (Shekelle et al, 2013). However, our understanding of the factors affecting successful implementation of patient safety initiatives is improving (Dixon-Woods et al, 2012) and there is a growing evidence base for the effectiveness of some interventions (Shekelle et al, 2013).

The slow progress of the patient safety movement is one of many reasons that makes resilience engineering theory appealing for understanding safety in healthcare systems. However, it is not the only reason. The theoretical underpinning recognises the pivotal role of healthcare professionals' ability to adapt to the varying demands of a healthcare system and thus maintain patient safety. This recognises healthcare professionals' skills and clinical experiences more effectively than many aspects of the current patient safety paradigm (Hollnagel et al, 2006; Hollnagel et al, 2013). Engagement with clinicians is a crucial success factor in improvement initiatives and is a strength of a resilience engineering approach. Of course, the challenges of implementing and evaluating interventions effectively is still a problem for resilience engineering

theory, perhaps more so due to the infancy of the theoretical perspective and lack of established methods.

1.3 Resilience Engineering

Resilience engineering theory offers a different perspective for understanding safety in large, complex socio-technical systems (Hollnagel et al, 2006). It recognises that adaptation is necessary for successful performance and safety should be about maximising what goes right, as well as minimising what goes wrong (Hollnagel et al, 2015). This theoretical perspective is not specific to healthcare and is used across a range of domains such as aviation, railway industries and nuclear power (Resilience Engineering Association, 2017). However, a dedicated movement for using this theoretical perspective to improve the safety of healthcare systems has grown over time (Hollnagel et al, 2013; Wears et al, 2015; Braithwaite et al, 2016). An exploration into the origins of resilience engineering theory and its conceptual foundations is necessary to understand how it differs from the existing healthcare safety paradigm and what it offers for improving it.

1.3.1 Origins of Resilience Engineering

Resilience is a popular concept used across a range of fields such as ecology, metallurgy, individual and organisational psychology, supply chain management and safety management (Bhamra et al, 2011; Hosseini et el, 2016; Hollnagel et al, 2016). There are broad similarities in how the concept of resilience is employed across these fields, with characteristics such as resistance to pressure or the ability recover quickly (Bhamra et al, 2011). However, resilience engineering theory is about understanding, analysing and improving resilient system performance (Hollnagel, 2016). Organisational resilience is the ability of a system to adjust its functioning prior to, during or following events (changes, disturbances and opportunities) and thereby sustain required operations under both expected and unexpected conditions (Hollnagel et al, 2015). Throughout this thesis the term resilience refers to organisational resilience as understood through a resilience engineering theoretical lens.

To understand how resilience engineering theory offers a different perspective for safety in healthcare, it is first necessary to understand the characteristics of large, complex socio-technical systems. A simple definition of a system is a set of connected parts that work towards a whole (Hitchins, 1992). A complex system has large numbers of connected parts, large numbers of relationships among connected parts and nonlinear relationships between them (Rouse, 2003). This complexity increases with the number of connected parts and the number and nature of the relationships between them. Examples of this sort of complexity include engineered systems, such as jet engines and nuclear power plants. In these types of systems, the system components and the relationships between them are known due to design (Rouse & Serban, 2011), but in many human systems, such as healthcare, processes are intractable because it is not possible to anticipate all possibilities and paths of action when autonomous agents interact.

The complexity of a system greatly increases when the connected parts include people and the relationships between them are social (Rouse & Serban, 2011). These types of systems are nonlinear and dynamic. They have autonomous agents (healthcare professionals) whose behaviour is determined by intentionality and social rules, rather than shaped by the engineered dynamics governing the system (Rouse & Serban, 2011). These social rules influence the way agents behave. There are variations in behaviour between groups of agents in different parts of the system and there is often conflict between their goals and behaviours. In response to this, agents adapt to each other's behaviours. This means overall system structure changes over time and behavioural patterns emerge rather than being designed into the system (Rouse & Serban, 2011). When investigating events in these large, complex sociotechnical systems, even with a deep understanding of the context, it still might not be possible to explain the working of higher-level phenomena in terms of lower-level phenomena (Rouse, 2007). The open nature of complex sociotechnical systems means they are often influenced by political, economic, cultural and organisational forces (Vincent, 2010). These are the types of systems that are the object of resilience engineering theory.

In healthcare systems, even simple tasks depend on a wide range of social (psychological and team) and technical (equipment and infrastructure) factors (Macrae, 2014). Healthcare systems are increasingly complex due to advancements in knowledge and technology, treatments and diagnostic techniques, ageing populations and increases in chronic health conditions (Hollnagel

et al, 2015). Proponents of resilience engineering theory maintain that the concepts and methods for understanding these systems have not progressed at the same rate as the complexity of the systems themselves (Hollnagel et al, 2006). Therefore, the methods are not sufficient for understanding how these complex systems work or how to improve their performance. This is the crux of why resilience engineering theory offers the potential to improve the knowledge and practices of safety in the healthcare domain.

The Resilience Engineering Association (REA) is the central body for the development and propagation of this field (REA, 2017; Berg et al, 2018; Patriarca et al, 2018). There is no single point of origin for the start of the resilience engineering movement, but its beginning can be mapped to several closely related events; including the first REA symposium in Sweden 2004 and the first resilience engineering book (Hollnagel et al, 2006), which collated the ideas from the first symposium (Bergström et al, 2015). These early works represent the initial ideas that informed the development of the resilience engineering field. From the outset, there is a clear intention to use these new theoretical insights to develop methods and tools to deliberately manage the adaptive ability of organisations to function safely (Nemeth & Herrera, 2015). However, during these early stages of development there is no real consensus about what these core concepts mean (Patriarca et al, 2018).

The REA symposia and resilience engineering book series continued to mark the incremental development of the resilience engineering field. The REA symposia continued every two years and there have been seven symposia from 2006 to 2017 (REA, 2018). There are ten books in the resilience engineering book series by Ashgate Publishers. It should be noted that Ashgate was taken over by CRC Press in 2016 (CRC Press, 2018). The initial books continued to collate the ideas from the symposia, however the scope of the books grows wider as the resilience engineering field develops. Initially the core ideas of the resilience engineering field are only published in these symposia proceedings and book series. However, as a consensus about the meaning of the core concepts develops (Bergström et al, 2015), research informed by resilience engineering theory is published in peer-reviewed academic journals (Furniss et al, 2011a) and other outputs, such as white papers (Hollnagel et al, 2015). The literature demonstrates a long and complex history to the concept of organisational resilience (Patriarca et al, 2018). This

process of theory development is reflected in the diverse definitions and indicators of resilience proposed over the past decade (Berg et al, 2018).

In a recent review of the resilience engineering literature, Berg et al (2018) suggest that the core concepts of this field are the distinction between Safety I and Safety II (Hollnagel, et al, 2006), the distinction between Work-As-Done and Work-As-Imagined (Hollnagel et al., 2015), and performance variability (Hollnagel, 2012). The distinction between Safety I and Safety II is one of the foundational concepts for resilience engineering theory and represents how this theoretical perspective differs from traditional approaches for understanding safety in complex systems. Safety I is characterised by focusing on negative outcomes. From this perspective, safety is about minimising, measuring and understanding things that go wrong. Safety II represents the resilience engineering approach and is characterised by focusing on positive outcomes. For this perspective, safety is about understanding and maximising what goes right (Hollnagel et al, 2015).

The Safety II perspective is underpinned by a series of related concepts about how work is done in complex sociotechnical systems. A central concept is that that adaptations are necessary for successful performance (Hollnagel et al, 2006; Hollnagel et al, 2008). People do their best to ensure the system works under various conditions by changing the way they work to respond to the demands in front of them (Hollnagel, 2016). The variability of everyday performance provides the impetus for the adaptations that are necessary to respond to dynamic system conditions (Hollnagel et al, 2015). Adaptation to changing conditions is why things go right most of the time. However, it is also the reason why things go wrong. Adaptations are the source of both success and failure. Outcomes are emergent from the interaction of system components and the complexity of sociotechnical systems means that these cannot always be predicted or explained by the system components themselves (Rouse, 2007). Crucially, an adaptation that normally leads to positive outcomes can lead to negative outcomes. The Safety II perspective advocates that safety is about maximising the conditions where adaptation leads to positive outcomes (Hollnagel et al, 2013).

The theoretical distinction between Work-as-Imagined and Work-as-Done accounts for the necessity of adaptations for ensuring successful system performance (Hollnagel et al, 2006). Work-as-Imagined (WAI) provides the basis for planning and represents an idealised version of

how work will be achieved. Work-as-Done (WAD) represents the work as it is actually achieved in the messy reality of complex systems (Hollnagel et al, 2015). Resilience engineering theory suggests that there is a necessary distinction between WAI and WAD because the variability of demands in a complex sociotechnical system mean that it is impossible to plan for all eventualities (Hollnagel, 2010). People working in the system must deviate from WAI to ensure successful performance across a range of conditions. This is Work-as-Done. There is a consensus that exploring organisational resilience should focus on everyday work, rather than disasters or exceptional circumstances, because this represents the normal ways in which people adapt to ensure everyday successful system performance (Hollnagel et al, 2015). Furthermore, organisational resilience is an emergent property of system performance and can only be viewed in the 'doing of the work' (Hollnagel, 2010).

Although the distinction between Work-As-Done and Work-As-Imagined is one of the core theoretical components of resilience engineering theory, understanding how work is done in complex systems is not exclusive to resilience engineering. Other approaches originating from the human factors discipline, such as Human-Computer Interaction (Dix, 2009; Helander, 2014), Naturalistic Decision Making (Klein, 2008; Zsambok & Klein, 2014) and Distributed Cognition (Hollan et al, 2000), also seek to understand how work is achieved in complex sociotechnical systems. Distributed cognition, for example, has emerged as an approach to system design which maintains the ways people make decisions and interact are dependent on the external environment as well as internal cognitive processes (Furniss et al, 2011). The environment can be analysed from a cognitive perspective, such as roles, artefacts and the physical layout of the environment and these can all impact how people process information (Furniss et al, 2011). Advocates for the utility of distributed cognition theory maintain this should inform the design of systems to maximise their effectiveness (Hollan et al, 2000). This approach has been applied in healthcare to analyse the roles of artefacts in facilitating communication within clinical teams (Nemeth et al, 2004; Xiao, 2005).

Resilience engineering theory moves beyond other approaches for understanding Work-As-Done in complex systems by proposing that the key focus of understanding performance in complex sociotechnical systems should be on how effective performance is maintained in the face of

variable system demands. It thus frames the importance of understanding everyday work as a problem of understanding human behaviour in response to complexity.

1.3.2 Resilient Healthcare

Researchers and clinicians have applied the resilience engineering theoretical lens to understanding and improving safety in healthcare systems (Berg et al, 2018). This is known as resilient healthcare (RHC) and is defined as 'the ability of the health care system (a clinic, ward, a hospital, a country) to adjust its functioning prior to, during or following events (changes, disturbances or opportunities), and thereby sustain required operations under both expected and unexpected conditions (Wears et al, 2015). The Resilient Health Care Network (RHCN) brings together researchers and healthcare practitioners, dedicated to studying resilient healthcare and applying the theory in practice (RHCN, 2018). There have been seven annual RHCN meetings since 2012 (RHCN, 2018). There are also four resilient healthcare books (Hollnagel et al, 2013; Wears et al, 2015; Braithwaite et al, 2017, Hollnagel et al, 2018). These books and meetings represent the incremental conceptual and methodological development of resilient healthcare theory and practices (Berg et al, 2018).

The current healthcare safety paradigm is based on retrospective analyses of errors, however resilient healthcare focuses on 'everyday clinical work', particularly on the ways it unfolds in practice (Braithwaite et al, 2017). Resilient healthcare theory can explain the limitations of the current healthcare safety paradigm. The hidden assumption of current safety practices in healthcare, such as accident investigation and root cause analysis is that complex systems can be meaningfully decomposed into their constituent parts and malfunctions in these parts can be identified and fixed (Hollnagel et al, 2015). Human error or technological failures are examples of malfunctions of these system parts (Hollnagel et al, 2015). Safety practices are therefore largely concerned with identifying the causes of things that go wrong and changing processes to prevent them from happening again. However, the nature of complex sociotechnical systems means that processes do not happen in a linear fashion and decomposing them into their constituent parts is not useful for understanding system performance. Instead, constant variability in the conditions under which healthcare is provided mean that adaptation is necessary to ensure successful outcomes (Hollnagel et al, 2015). However, the same adaptations that result in successful

outcomes can also result in adverse outcomes (Hollnagel et al, 2006). This is a key distinction from the current safety paradigm. Resilient healthcare focuses on ways to understand and improve the successful outcomes from adaptations at a systems level, whilst trying to reduce adverse outcomes (Hollnagel et al, 2013).

The two main approaches for operationalising resilient healthcare concepts are the four resilience abilities and the Centre for Applied Resilience in Healthcare (CARe) model of organisational resilience (Berg et al, 2018). The CARe model of organisational resilience (Figure 1-1), operationalises the key resilient healthcare concepts and the way they interact, to guide empirical investigation of resilient healthcare practices (Anderson et al, 2016). Demand and capacity are broadly defined, so they capture all elements of work across micro, meso and macro levels (Back et al, 2017). This means that system demands include the number and acuity of patients, as well as standards of patient care and hospital targets. System capacity to meet these demands spans staffing level and skill mix, as well as organisation of services and escalation protocols (Anderson et al, 2016). The model conceptualises Work-as-Imagined as the planned alignment of system capacity with system demand. However, the reality of the fluctuating nature of healthcare systems meant that system capacity can never fully account for system demands.

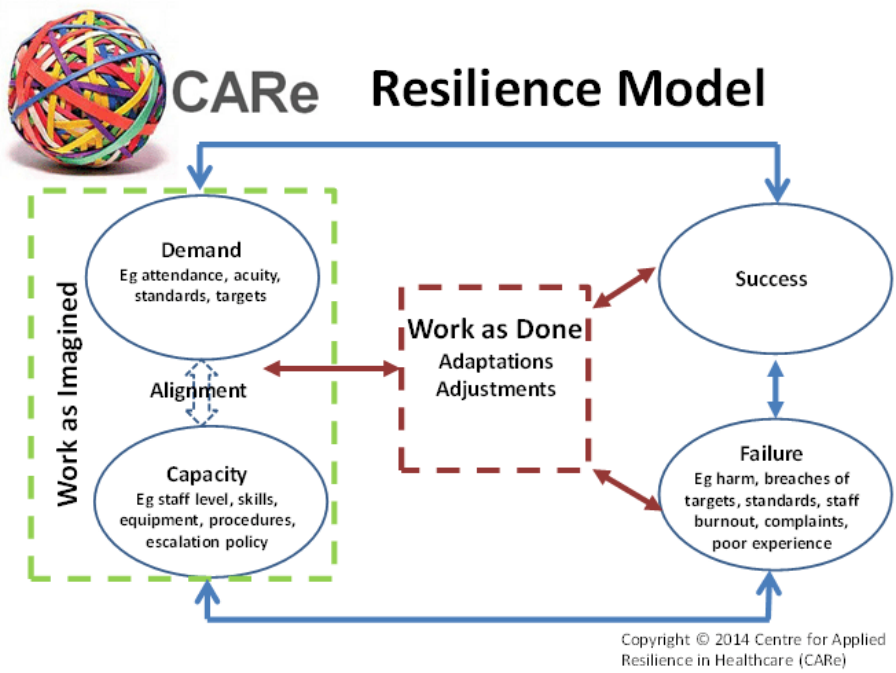

Figure 1-1 CARe Resilience Model (CARe, 2014)

In response to this, healthcare professionals adapt or adjust their work to meet fluctuating system demands. In this way, they re-align system capacity with system demand and allow the healthcare system to function. This is the Work-as-Done. These adaptations are necessary for the system to function, but they lead to both success and failure (Hollnagel et al, 2006). Success and failure are also broadly defined, given that the dynamic trade-offs can change what is considered successful in different contexts (Anderson et al, 2016). The intention of the model is that it provides a broad outline of how the main resilient healthcare concepts interact with each other, to support empirical of investigation of resilient healthcare practices, rather than provide a complete understanding of resilient healthcare theory (Anderson et al, 2016).

The four resilience abilities operationalise a different set of core resilient healthcare concepts (Berg et al, 2018). The four resilience abilities originate from a broader resilience engineering theoretical perspective and provide some structure for understanding organisational resilience in practice (Hollnagel, 2010). Organisational resilience is an emergent property of system performance, it is something a system does rather than something is has (Hollnagel et al, 2015). A more specific understanding of organisational resilience can be achieved by considering what makes a resilient performance possible (Hollnagel, 2010). To this end, Hollnagel (2010) suggests four abilities that are equally necessary and jointly sufficient to enable resilient performance. Currently they are known as the four resilience abilities, but in the past, they were referred to as the four cornerstones or the four potentials for resilient performance (Hollnagel, 2010; Hollnagel, 2015). All these terms referred to the same four concepts:

1. The ability to respond – being able to respond to expected and unexpected disturbances or take advantage of opportunities; by employing prepared responses or by changing the current mode of functioning.
2. The ability to monitor – being able to look for that which is or could affect the performance of the system in a positive or negative sense.
3. The ability to learn – being able to learn the right lessons from the right experience.
4. The ability to anticipate – being able to anticipate developments (both positive and negative) further into the future (Hollnagel, 2010)

The accessibility of the four resilience abilities means they have been widely used to understand resilience healthcare practices (Berg et al, 2018). They are also central to the Resilience Analysis Grid (RAG), which is an approach for analysing organisational resilience (Hollnagel, 2010). The RAG has been used several times for analysing organisational resilience in healthcare systems (Chuang, 2015; Hunte, 2016; Engvall et al, 2017).

1.3.3 Current Limitations of Resilience Engineering

A series of literature reviews (Bergström et al, 2015; Righi et al, 2015; Hosseini, et al; 2016; Berg et al, 2018; Patriarca et al, 2018) suggest there is now an established consensus about the core concepts of resilience engineering theory. Many still believe that resilience engineering theory should inform methods and tools to deliberately manage the ability of organisations to adapt to pressures and function safely (Nemeth & Herrera, 2015). However, there is ongoing criticism there has not yet been sufficient methodological development to support this in practice (Patriarca et al, 2018).

The resilience engineering literature demonstrates a complex history to the concept of organisational resilience (Patriarca et al, 2018). There have been a range of diverse definitions and indicators of resilience proposed over the past decade (Berg et al, 2018). This diffuse set of theoretical principles has limited the methodological development of resilience engineering theory (Furniss et al, 2011a). Consequently, there has been a lack of empirical testing of these theoretical perspectives, with little evidence to support the theoretical claims of the resilience engineering principles (Bhamra et al, 2011; Anderson et al, 2016).

The established approaches for operationalising resilient healthcare, (Hollnagel, 2010; Anderson et al, 2016; Back et al, 2017) demonstrate value for understanding resilient system performance. However, they still require further methodological development to demonstrate they can improve the safety of healthcare systems. The CARe model has supported the development of system level interventions to improve system performance (Back et al, 2017). However, the four resilience abilities still need further methodological development to move from explaining resilient system performance to improving resilient system performance. The Resilience Analysis Grid (RAG) offers the possibility to do this, however there is no clear way to develop new questions specific

to a given system (Berg et al, 2018). Unless resilience engineering principles can demonstrate an improvement to the quality of care in practice, with clear guidance on how to apply them, the ideas will not be taken up by the wider scientific community (Anderson et al, 2016). Resilient healthcare theory has generated some tools for understanding resilient system performance, however it has not been able to translate these tools to support the analysis of resilient healthcare (Berg et al, 2018; Patriarca et al, 2018).

1.4 Concluding Remarks

The current healthcare safety paradigm is limited in terms of improving the quality of care, and progress appears to have stalled. Resilience engineering theory offers an appealing alternative theoretical lens for understanding safety in healthcare systems. Conceptually, it can account for the limitations of the current healthcare safety paradigm. However, without suitable methods for its application in practice, resilient healthcare theory may struggle to move from explaining resilient system performance to developing ways to analyse and improve it.

Considering the current state of the resilient healthcare field, this thesis aims to advance the methodology of resilient healthcare theory and examine its usefulness for quality improvement in healthcare. To achieve this, this thesis will advance the Resilience Analysis Grid (RAG) by developing a replicable process for generating responding, monitoring, learning and anticipating questions relevant to a given healthcare system, and then implement this process to explore its effectiveness for analysing organisational resilience in healthcare. It will also involve healthcare professionals in this process and support them to identify system level interventions to improve the potential for resilient performance.

Chapter 2 - Narrative Review of Methods for Analysing Organisational Resilience

This chapter presents the findings from a narrative review of methods for analysing organisational resilience. The intention of the review was to identify existing methods for analysing organisational resilience that could be applied to healthcare systems. The researcher considered a narrative review most appropriate for examining the resilience engineering literature because it identified the different themes of the field and integrated them in order to understand the status of the research. The search strategy identified a range of relevant approaches, from conceptual conference proceedings to empirically tested methods in peer reviewed academic journals. Most of the methods were found in book chapters and conference proceedings. The researcher and supervisor team developed evaluative criteria so that these methods could be meaningfully compared.

2.1 Introduction

Over the course of its development, the resilience engineering community has proposed a series of approaches to defining, characterising and modelling the concept of organisational resilience (Rigaud et al, 2015). Consequently, there are a spectrum of approaches for analysing organisational resilience. This is particularly true of the early resilience engineering literature, before the research community reached a consensus about the core concepts (Hollnagel et al, 2006; Hollnagel et al, 2008). Previous reviews of the resilience engineering literature have focused on identifying the areas of research focus (Righi et al, 2015; Patriarca et al, 2018), the nature of organisational resilience (Bergström et al, 2015) and methodological approaches to studying resilient healthcare (Berg et al, 2018). Initial searches showed there have been no reviews examining methods for analysing organisational resilience.

The early thought leaders of the resilience engineering community, such as Hollnagel and Woods have been critical of developing methods for measuring organisational resilience (Hollnagel et al, 2006; Hollnagel et al, 2008; Hollnagel et al, 2015). They were concerned that measuring organisational resilience would reduce this complex, nuanced concept to simple numerical

figures, thereby undermining the value of this theoretical lens. Despite their concerns, a continued interest in resilience engineering theory has motivated researchers to develop methods to analyse organisational resilience. As consensus about the core concepts of resilience engineering emerged from 2006 to 2015 (Hollnagel et al, 2006; Hollnagel et al, 2015), the thought leaders of the community have suggested ways that resilient performance could be analysed and proposed methods such as the Resilience Analysis Grid (RAG) (Hollnagel, 2010) and the stress-strain model (Woods et al, 2006). Hollnagel suggests it is not possible to directly measure organisational resilience, but it is possible to analyse what makes a resilient performance possible (Hollnagel, 2010). However, this has not been universally agreed upon and over time researchers developed a variety of ways to explain and interpret resilient performance, including measuring, analysing, modelling and assessing organisational resilience (Mendonça, 2008; Hollnagel et al, 2010; Hollnagel 2014, Rigaud et al, 2015). The aim of this review was to identify and evaluate these different approaches to find the most promising method for analysing organisational resilience in healthcare systems. To that end, there were several research questions for the review:

1. What are the different ways to analyse organisational resilience?
2. What are the strengths and weaknesses of different approaches to analysing organisational resilience?
3. Are there any methods for analysing organisational resilience in healthcare?
4. Can methods used in other complex systems be used to analyse organisational resilience in healthcare?

2.2 Methodology

Literature reviews are an essential mechanism for summarising and synthesising the knowledge base on a particular subject (Dijkers, 2009; Aveyard, 2014). As the amount of literature about a subject increases, so does the need for a review and appraisal of what the literature means for the field of inquiry (Pautasso, 2013) (Figure 2-1). There has been increasing interest in finding ways to analyse organisational resilience, however there has not yet been a comprehensive literature review of methods for analysing organisational resilience.

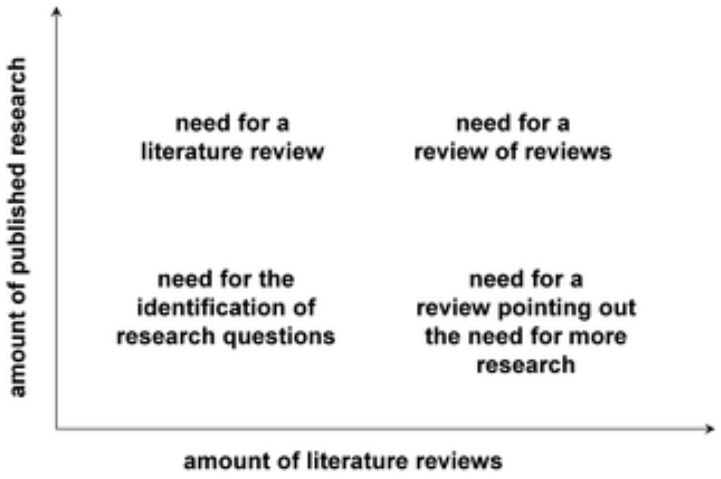

Figure 2-1 Status of literature and need for literature reviews (Pautasso, 2013)

Resilience engineering is still considered an emerging discipline (Anderson et al, 2016). The resilience engineering literature is varied in terms of focus and level of development. A combination of qualitative, quantitative and mixed method studies have been published in a range of outputs from conference proceedings to peer-reviewed academic journals. This effort has been about how to understand organisational resilience in complex systems and not evaluating the effectiveness of the resilience engineering theoretical lens. Methods for reviewing evidence and synthesising results should be tailored to the research question and the status of the literature (Pope et al, 2007). A narrative review method was identified as most effective for identifying and integrating the variety of approaches for analysing organisational resilience in the resilience engineering community (Grant & Booth, 2009).

Narrative reviews are flexible, which allows them to include different types of evidence, such as qualitative and quantitative, research and non-research (Dixon-Woods et al, 2004). This meant it could account for the pluralities of the resilience engineering field (Collins & Fauser, 2005; Dijkers, 2009; Greenhalgh et al, 2018). Since there have been few published studies of applications of methods (see p.65), it was not feasible to conduct a systematic review of effectiveness. Narrative reviews are often contrasted to systematic reviews, with the former criticised for the risk of introducing bias into the search strategy and the later lauded for its rigorous search strategies to prevent this (Greenhalgh et al, 2018). Although narrative reviews do not have the same strict protocols as systematic reviews, they can still demonstrate the same explicit approaches to the identification and selection of evidence, attention to the methodological quality of the studies

included and produce a higher order synthesis to produce new knowledge of a research topic (Pope et al, 2007).

2.2.1 Scoping the Literature

The researcher carried out initial searches to define the scope of the narrative review (Jones, 2004). These initial searches used the keywords ‘organisational resilience’, ‘measure’ and ‘analysis’ with Google Scholar, Medline, Scopus and Web of Science to gain an understanding of the resilience engineering literature and its application in healthcare. There were three main outcomes of these initial searches. Firstly, resilience is a popular concept used across a range of domains such as ecology, metallurgy, individual and organisational psychology, supply chain management, strategic management and safety engineering (Bhamra et al, 2011). Secondly, it is an ill-defined concept, since the meaning of resilience varied across these domains. Even the term ‘organisational resilience’ has different meanings across these domains (McManus et al, 2008; Hollnagel, 2010). Thirdly, only a small amount of the resilience engineering literature is available in peer-reviewed academic journals. Most of the relevant literature is available in a resilience engineering book series and the Resilience Engineering Association symposia proceedings.

The findings from the scoping searches informed an explicit focus on methods for analysing organisational resilience from a resilience engineering perspective. The resilience engineering literature shows a continued interest in understanding and improving the safety of complex systems (Hollnagel et al, 2006; Hollnagel et al, 2015). It also has a growing body of research focused on applying these perspectives to healthcare systems (Hollnagel et al, 2013; Wears et al, 2015; Braithwaite et al, 2016; Hollnagel et al, 2018). The scoping searches showed that the resilience engineering community is tight-knit and foundational thought leaders have had strong influence on the development of the field (Hollnagel et al, 2006; Hollnagel et al, 2015). Most of the early literature is published by the Resilience Engineering Association in a dedicated book series and symposia proceedings, however recently there have been more regular publications of resilience engineering studies in peer-reviewed academic journals. It was clear that exploring the range of methods for analysing organisational resilience needed to account for the way this field developed.

2.2.2 Design

The researcher used a two-stage narrative review design, adapted from Kitson et al (2013), to search the resilience engineering literature. The first stage was to identify the well-established sources of resilience engineering literature. The second stage was to search these sources for methods of analysing organisational resilience, which included searching the citations and references of any relevant literature. This was an inclusive review, so critical appraisal was not associated with decisions about which studies to include or exclude. However, evaluative criteria were used to appraise the different methods for analysing organisational resilience so that the spectrum of research, from conference proceedings to articles in peer-reviewed academic journals, could be meaningfully compared.

2.2.3 Search Method

The initial scoping searches, previous resilience engineering literature reviews (Bergström et al, 2015; Righi et al, 2015; Berg et al, 2018; Patriarca et al, 2018), and discussion with supervisors and subject experts identified three primary sources of resilience engineering literature: the Resilience Engineering Association book series, the biennial Resilience Engineering Association symposia and three peer-reviewed academic journals that regularly publish resilience engineering articles. During the initial development of the resilience engineering field, the biennial symposia were the primary sources of new ideas, with the first symposium held in 2006. The book series began with committing these ideas to paper, then over time it began to show a wider scope, with books being published more regularly than the symposia and not just limited to ideas from the symposia. The books series remains the primary source for the core ideas of the resilience engineering field. Gradually over time there has been an increase in articles published in peer reviewed academic journals. Specifically, there has been three journals which have published most of the resilience engineering articles, including some special editions: Reliability Engineering and System Safety; Cognition, Technology & Work; Safety Science.

The researcher examined the titles and abstracts of the conference proceedings of the seven Resilience Engineering Association Symposia from 2006 to 2017, and the book chapters and

indexes of the ten books of the Resilience Engineering Association book series. Keyword searches were used to search the three journal databases, using the terms: ‘organisational resilience’, ‘measure’, ‘assess’, ‘evaluate’ and ‘analyse’. The researcher screened the titles and abstracts of the articles, then read each article to identify the relevant papers. Conference proceedings, book chapters and research articles were included if they made some conceptual or methodological contribution to measuring, analysing or evaluating organisational resilience. The researcher read the references and citations of literature identified from this search strategy to identify any further relevant literature. Two further peer-reviewed academic journals and one conference proceeding were found. The detailed search results can be found in Appendix B p.212. The narrative review identified 33 relevant articles, but only 32 were included because one paper was not available in English (Catalan & Roberts, 2010). Figure 2-2 presents a modified PRISMA flowchart of the search results.

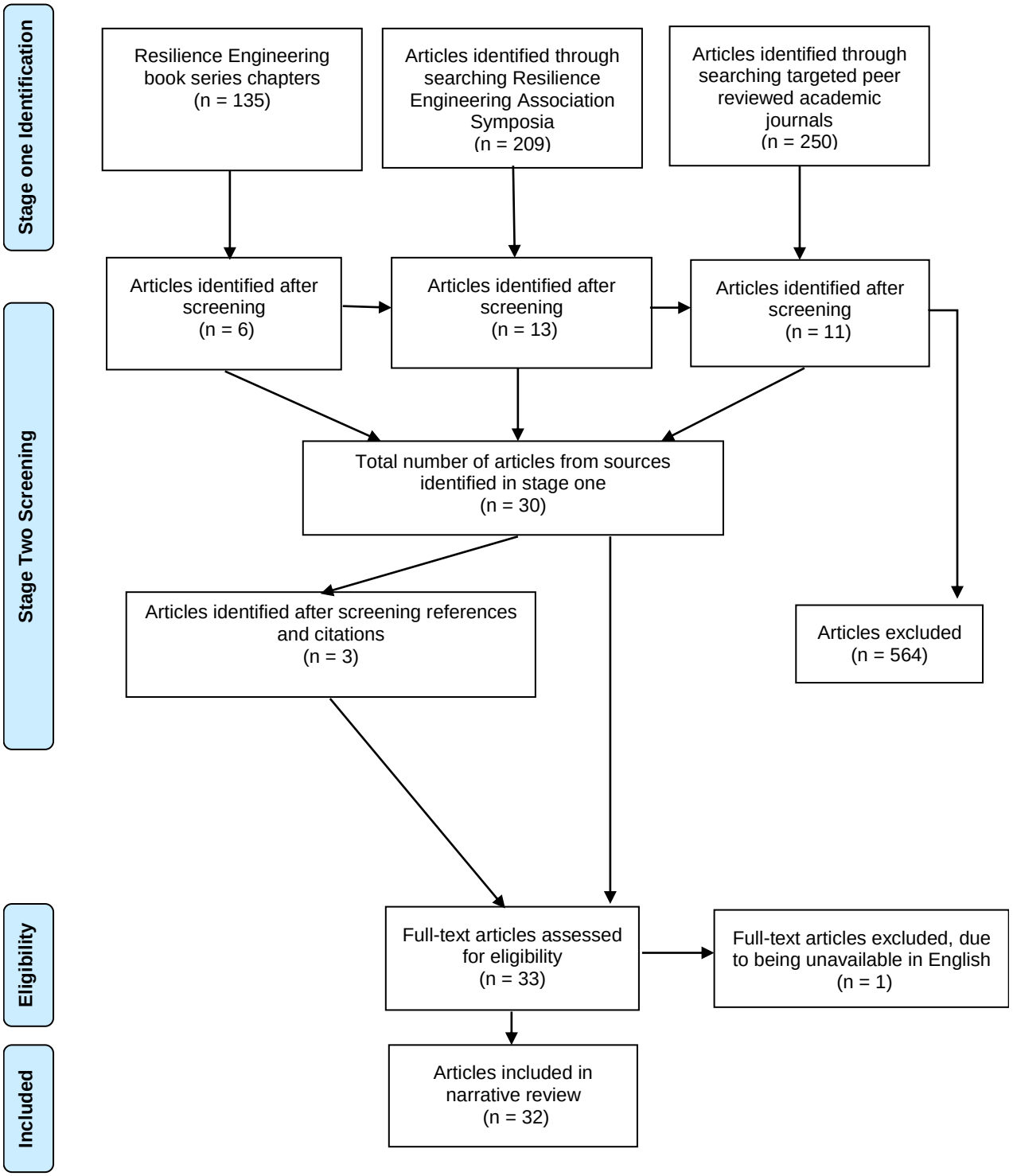

Figure 2-2 Modified PRISMA flowchart of narrative review search results

2.2.4 Evaluative Criteria

The scoping searches showed there is a wide range of relevant resilience engineering literature, from conference proceedings outlining the conceptual basis for measuring organisational resilience to research articles published in peer reviewed academic journals with empirically tested methods. This presented a challenge for comparison and subsequent analysis of the relevant literature. The researcher and supervisors developed four evaluative criteria (Table 2-1), informed by discussion with subject experts and perceived insufficiencies of the literature from the scoping searches, to systematically assess and meaningfully compare the literature, despite the variation in quality. The criteria were equally necessary and jointly sufficient for considering a method appropriate for analysing organisational resilience in healthcare. The researcher assessed each paper as poor, moderate or good for each of the evaluative criteria.

The first criterion is conceptual clarity. For a method to have good conceptual clarity, there needed to be internal consistency between the concepts used within the method, and a clear link between these concepts and resilience engineering theory. The second criterion is methodological guidance. For a method to have good methodological guidance, there needed to be a clear method for using the method in practice. The third criterion is applicability. For a method to have good applicability, a method needed to be applied by researchers that were not involved in developing it. The fourth criterion is representation of social elements of resilient system performance. Methods for analysing organisational resilience need to capture both social and technical aspects of system performance to effectively examine organisational resilience. The term ‘social elements’ refers to the social processes that are vital for facilitating resilient performance, such as coordination and articulation of work, negotiation of competing goals and dynamic trade-offs (Wears & Perry, 2006; Ross et al, 2014; Sujan et al, 2015). This is central to understanding resilient performance in healthcare systems, where care is delivered by human beings to human beings. An entirely technical method for analysing organisational resilience fails to capture the nuances of this.

Table 2-1 Evaluative criteria of methods for analysing organisational resilience

Evaluative criteria	Score		
	Good	Moderate	Poor
Conceptual Clarity	Clear relationship between underpinning concepts and how they relate to analysing organisational resilience according to resilience engineering theory	Clear relationship between underpinning concepts, but unclear how they relate to analysing organisational resilience according to resilience engineering theory	Unclear relationship between underpinning concepts and how they relate to analysing organisational resilience according to resilience engineering theory
Methodological Guidance	Clear guidance about how to use the method for analysing organisational resilience	Some rudimentary methods for using this method in practice, but unclear how to use it	Entirely conceptual, with no clear guidance for using this method in practice
Application in practice	Applied by researchers who were not involved in developing the method	Applied by researchers who developed the method	No application in practice
Representation of the social	Equal representation of social and technical aspects of resilient system performance	Some representation of social elements of system performance, but unequal weighting in favour of technical elements	No representation of social elements of resilient system performance

2.3 Search Results

Table 2-2 presents an overview of the articles included in the review.

Table 2-2 Papers included in the narrative review

No.	Reference	Conceptual clarity	Methodological guidance	Application in practice	Representation of social
1	Woods, D., Wreathall, J. & Anders, S. (2006). Stress-Strain Plots as a Model of an Organisation's Resilience. Paper presented at the *2nd Resilience Engineering Association Symposium,* France.	Moderate	Poor	Moderate	Poor
2	Mendonça, D. (2008). Measures of Resilient Performance. In. Hollnagel, E., Nemeth C. & Dekker S. (Eds). *Resilience Engineering Perspectives, Volume 1: Remaining Sensitive to the Possibility of Failure.* Ashgate.	Good	Poor	Poor	Moderate
3	Woods, D. & Wreathall, J. (2008). Stress-Strain Plots as a Basis for Assessing System Resilience. In. Hollnagel, E., Nemeth C., & Dekker S. (Eds). *Resilience Engineering Perspectives, Volume 1: Remaining Sensitive to the Possibility of Failure.* Ashgate.	Moderate	Poor	Moderate	Poor
4	Johansson, B. & Lindgren, M. (2008). A Quick and Dirty Evaluation of Resilience Enhancing Properties in Safety Critical Systems. Paper presented at the *3rd Resilience Engineering Association Symposium*, France.	Moderate	Poor	Moderate	Poor
5	Woltjer, R. (2008). Resilience assessment based on models of functional resonance. Paper presented at the *3rd Resilience Association Engineering Symposium*, France.	Moderate	Moderate	Moderate	Moderate
6	Wreathall, J. (2009). Measuring Resilience. In. Nemeth, C., Hollnagel, E. & Dekker, S., (Eds). *Resilience Engineering Perspectives Volume 2: Preparation and Restoration.* Ashgate.	Moderate	Moderate	Moderate	Poor
7	Ferreira, P., Wilson, J., Ryan, B., & Sharples, S. (2010). Measuring Resilience in the Planning of Rail Engineering Work. In. Hollnagel, E., Paries, J., Woods, D., & Wreathall, J. (Eds). *Resilience engineering in practice: A guidebook*. Ashgate.	Moderate	Moderate	Moderate	Moderate

No.	Reference	Conceptual clarity	Methodological guidance	Application in practice	Representation of social
8	Hollnagel, E. (2010). Epilogue: RAG – The Resilience Analysis Grid. In. Hollnagel, E., Paries, J., Woods, D., & Wreathall, J. (Eds). *Resilience engineering in practice: A guidebook*. Ashgate.	Good	Moderate	Good	Moderate
9	Øien, K., Massaiu, S., Tinmannsvik, R. & Størseth, F. (2010). Development of early warning indicators based on resilience engineering. Paper presented at *10th International Probabilistic Safety Assessment & Management Conference*. Seattle, Washington.	Moderate	Moderate	Moderate	Poor
10	Furniss, D., Back, J., Blandford, A., Hildebrandt, M. & Broberg, H. (2011a). A Resilience Markers Framework for Small Teams. *Reliability Engineering & System Safety*, 96(1), 2-10.	Good	Moderate	Good	Moderate
11	Hollnagel, E. (2012). *FRAM: The Functional Resonance Analysis Method*. Ashgate.	Good	Good	Good	Moderate
12	Saurin, T., & Junior, G. (2012). A Framework for Identifying and Analyzing Sources of Resilience and Brittleness: a Case Study of Two Air Taxi Carriers. *International Journal of Industrial Economics*, *42* (3), 312-324.	Good	Moderate	Moderate	Poor
13	Grecco, C., Vidal, M., Cosenza, C., Santos, I. & Carvalho, P. (2013*). A Fuzzy Model to Assess Resilience for Safety Management.* Paper presented at *5th Resilience Engineering Association Symposium. Managing Trade-Offs*. Soesterberg, Netherlands.	Moderate	Poor	Moderate	Poor
14	Herrera, I, A., Vennesland, A., Pasquini, A., & Silvagni, S. (2013). Planning Measuring Resilience Potential and Early Warnings (SCALES). Paper presented at *5th Resilience Engineering Association Symposium. Managing Trade-Offs*. Soesterberg, Netherlands.	Moderate	Poor	Moderate	Poor

No.	Reference	Conceptual clarity	Methodological guidance	Application in practice	Representation of social
15	Lundberg, J., & Woltjer, R. (2013). The Resilience Analysis Matrix (RAM): Visualizing Functional Dependencies in Complex Socio-Technical Systems. Paper presented at *5th Resilience Engineering Association Symposium. Managing Trade-Offs*. Soesterberg, Netherlands.	Moderate	Moderate	Moderate	Poor
16	Siegel, W., & Schraagen, J. M. (2013). Developing Resilience Signals for the Dutch Railway System. Paper presented at *5th Resilience Engineering Association Symposium. Managing Trade-Offs*. Soesterberg, Netherlands.	Moderate	Poor	Moderate	Poor
17	Woods, D., Chan, Y. J., & Wreathall, J. (2013). The Stress Strain Model of Resilience Operationalizes the Four Cornerstones of Resilience Engineering. Paper presented at *5th Resilience Engineering Association Symposium. Managing Trade-Offs*. Soesterberg, Netherlands.	Moderate	Poor	Moderate	Poor
18	Rankin, A., Lundberg, J. & Woltjer, R. (2014). A Framework for Learning from Adaptive Performance. In. Nemeth, C. & Hollnagel, E. Eds. *Resilience Engineering in Practice Volume 2: Becoming Resilient*. Ashgate.	Poor	Moderate	Moderate	Poor
19	Azadeh, A., Salehi, V., Arvan, M. & Dolatkhah, M. (2014). Assessment of resilience engineering factors in high-risk environments by fuzzy cognitive maps: A petrochemical plant. *Safety Science*, 68, 99-107.	Moderate	Moderate	Moderate	Poor
20	Francis, R. & Bekera, B. (2014). A metric and frameworks for resilience analysis of engineered and infrastructure systems. *Reliability Engineering & System Safety*, 121, 90-103.	Moderate	Moderate	Moderate	Poor
21	Rankin, A., Lundberg, J., Woltjer, R., Rollenhagen, C. & Hollnagel, E. (2014). Resilience in everyday operations a framework for analyzing adaptations in high-risk work. *Journal of Cognitive Engineering and Decision Making,* 8(1), 78-97.	Moderate	Poor	Moderate	Poor

No.	Reference	Conceptual clarity	Methodological guidance	Application in practice	Representation of social
22	Rigaud, E., Neveu, C., Langa, S., & Obrist, M. (2015). Sociotechnical System Resilience Assessment and Improvement Method. Paper presented *at 6th Resilience Engineering Association Symposium*. Lisbon, Portugal.	Moderate	Poor	Poor	Poor
23	Saurin, T. (2015). Classification and Assessment of Slack: Implications for Resilience. Paper presented at *6th Resilience Engineering Association Symposium*. Lisbon, Portugal.	Moderate	Moderate	Moderate	Poor
24	Shirali, G. A., Motamedzade, M., Mohammadfam, I., Ebrahimipour, V., & Moghimbeigi, A. (2016). Assessment of resilience engineering factors based on system properties in a process industry. *Cognition, Technology & Work*, 18(1), 19-31.	Moderate	Moderate	Moderate	Poor
25	van der Beek, D. & Schraagen, J. M. (2015). ADAPTER: Analysing and developing adaptability and performance in teams to enhance resilience. *Reliability Engineering & System Safety,* 141, 33-44.	Moderate	Moderate	Moderate	Moderate
26	Mendonça, D. & Wallace, W.A. (2015). Factors underlying organizational resilience: The case of electric power restoration in New York City after 11 September 2001. *Reliability Engineering & System Safety*, 141, 83-91.	Good	Poor	Moderate	Moderate
27	Stroeve, S. & Everdij, M. (2017). Agent-based modelling and mental simulation for resilience engineering in air transport. *Safety Science,* 93, 29-49.	Moderate	Moderate	Moderate	Poor
28	Raben, D., Bogh, S., Viskum, B., Mikkelsen, K., & Hollnagel, E. (2017). Proposing leading indicators for blood sampling: application of a method based on the principles of resilient healthcare. *Cognition, Technology & Work*, 19(4), 809-817.	Moderate	Moderate	Moderate	Moderate
29	Saurin, T., & Werle, N. (2017). A framework for the analysis of slack in socio-technical systems. *Reliability Engineering & System Safety*, 167, 439-451.	Moderate	Moderate	Moderate	Poor

No.	Reference	Conceptual clarity	Methodological guidance	Application in practice	Representation of social
30	Patriarca, R., Di Gravio, G., Constantino, F., Tronci, M. (2017). FRAM to assess performance variability in everyday work: functional resonance in the railway domain. Paper presented at *7th Resilience Engineering Association Symposium*. Luik, Belgium.	Moderate	Moderate	Moderate	Poor
31	Rubio-Romero, J., Pardo-Ferreira, M., De la Varga-Salto, J., & Galindo-Reyes, F. (2018). Composite leading indicator to assess the resilience engineering in occupational health & safety in municipal solid waste management companies. *Safety Science*, 108, 161-172.	Moderate	Moderate	Moderate	Poor
32	Jain, P., Mentzer, R., & Mannan, M. S. (2018). Resilience metrics for improved process-risk decision making: Survey, analysis and application. *Safety Science*, 108, 13-28.	Moderate	Moderate	Moderate	Poor

2.4 Findings

The resilience engineering literature about measuring or analysing organisational resilience is fragmented and inconsistent. Many of the initial ideas were from conference proceedings or book chapters and lacked sufficient conceptual development for any rigorous application in practice. Subsequently, there was little evidence to support the value of these approaches. Many of the articles from the peer reviewed academic journals demonstrated impenetrable or inappropriate methods, which did not align with the core ideas of resilience engineering theory or the focus of this study.

The findings are structured so that similar theoretical and methodological approaches are presented and analysed together. There are three established methods for analysing organisational resilience: the Resilience Analysis Grid (RAG) (Hollnagel, 2010) the Resilience Markers Framework (RMF) (Furniss et al, 2011a) and the Functional Resonance Analysis Method (FRAM) (Hollnagel, 2012). There are attempts to improve each of these established methods, however there is no evidence that these attempts added value or advanced these established methods (Van der Beek & Scharaagen, 2015; Rankin et al, 2014b; Patricia et al, 2017). There are a series of methods which use a leading indicator informed approach to analysing organisational resilience (Øien et al, 2010; Grecco et al, 2013; Herrera et al, 2013; Siegel & Schraagen, 2013; Shirali et al, 2015; Raben et al 2017; Rubio-Romero et al, 2018). The final group of methods contains the remaining approaches which do not share any conceptual or methodological similarities to these other methods for analysing organisational resilience.

2.4.1 Resilience Analysis Grid

The Resilience Analysis Grid (RAG) is directly informed by Hollnagel's understanding of organisational resilience (Hollnagel, 2010). He suggests it is not possible to directly measure organisational resilience, but it is possible to analyse what makes a resilient performance possible (Hollnagel, 2010). There are four abilities that are equally necessary and jointly

sufficient to explain resilient performance. Currently these are known as the four resilience abilities, but previously they have been known as the four cornerstones or the four potentials for resilient performance (Hollnagel, 2010; Hollnagel, 2015). All these terms refer to the same four concepts:

1. The ability to respond – being able to respond to expected and unexpected disturbances or take advantage of opportunities; by employing prepared responses or by changing the current mode of functioning
2. The ability to monitor – being able to look for that which is or could affect the performance of the system in a positive or negative sense
3. The ability to learn – being able to learn the right lessons from the right experience
4. The ability to anticipate – being able to anticipate developments (both positive and negative) further into the future (Hollnagel, 2010)

According to Hollnagel (2010), analysing organisational resilience should be concerned with the extent to which these resilience abilities are present (or absent) in system performance. By operationalising these concepts, they are transformed from a series of abstract ideas to specific activities that can be observed and analysed using four sets of questions (see Appendix A, p.210). Table 2-3 shows an example of the questions for analysing the ability to respond. The answers can be measured on a five-point Likert scale, to develop a profile of how well a system can perform each attribute. The result is as a proxy measure of organisational resilience (Hollnagel, 2010).

Table 2-3 Resilience Analysis Grid questions relating to the ability to respond

Aspect of Responding	Question
Event List	What are the events for which the system has a prepared response?
Background	How were these events selected (tradition, regular requirements, design basis, experience, expertise, risk assessment, industry standard, etc.)?
Relevance	When was the list created? How often is it revised? On which basis is it revised? Who is responsible for maintaining and evaluating the list?
Threshold	When is a response activated? What is the triggering criterion or threshold? Is the criterion absolute or does it depend on internal/external factors? Is there a trade-off between e.g. safety and productivity?

Response List	How was the specific type of response list decided? How is it ascertained that it is adequate? (Empirically, or based on analyses or models?)
Speed	How fast is full response ability available? How fast can an effective response be implemented?
Duration	For how long can a 100% effective response be sustained? What is the minimum acceptable response level and how long can it be sustained?
Stop Rule	What is the criterion for ending the response and returning to a 'normal' state?
Response Capability	How many resources are allocated to ensure response readiness (people, equipment, materials)? How many are exclusive for the response potential? Who is responsible for maintaining the response ability?
Verification	How is the readiness to respond maintained? How and when is the readiness to respond verified?

The results of the RAG can be plotted on a radar chart diagram, to graphically represent the results of the analysis (Figure 2-3). Comparisons across different time points can identify any change in the potential for resilient performance. In its current form, the RAG provides the conceptual basis for analysing the organisational resilience of a complex system, however it is limited by an implementation gap. The questions need to be tailored to each new system in which the RAG is applied (Hollnagel, 2010), however there is no method for generating new questions for each new system. There is face validity for the four resilience abilities, but no empirical evidence for them or the original questions (Van der Beek & Schraagen, 2015).

Figure 2-3 Radar Chart diagram comparing RAG applications over time

The RAG has been used in several domains, such as healthcare (Axelsson & Ros, 2015; Chuang, 2015; Hunte, 2016; Engvall et al, 2017), air traffic management (Praetorius et al, 2012) and the space industry (Nemeth et al, 2017). However, the implementation gap means researchers have used the RAG in different ways. The most common approach has been to directly apply the original RAG questions to a system (Praetorius et al, 2012). Researchers

have also attempted to adapt the original questions, so they were more specific to a system. For example, some researchers used the original RAG questions as a platform for discussion with frontline workers and edited the original questions in response to this (Praetorius et al, 2012; Hunte, 2016; Engvall et al, 2017). Another way was to use local standard operating procedures to edit the original questions to be more relevant to a system (Chuang, 2015). All these attempts at applying the RAG began with the original questions and attempted to tailor them to a system. This meant they explored the four resilience abilities separately, despite resilience engineering theory suggesting they are interdependent and simultaneous (Hollnagel et al, 2006; Hollnagel, 2010). It was not clear how well the participants involved in these discussions understood the subtleties of resilience engineering theory nor how researchers presented the questions to them. The original RAG questions are abstract and written in a way that is inaccessible to most frontline workers.

There have also been attempts at making more substantial improvements to the RAG. For example, one attempt included team work questions in addition to the questions about the four resilience abilities (Van der Beek & Schraagen, 2015). The four resilience abilities are most often discussed at an organisational level, but Van der Beek & Schraagen (2015) suggest they are as relevant at team level and that team performance affects system performance. To account for this, they expand the scope of the RAG with questions about shared transformational leadership and cooperation with other teams (Van der Beek & Schraagen, 2015). Although there may be a connection between team and system performance, the focus of resilience engineering theory is system level performance because this is where the heart of the complexity lies (Hollnagel et al, 2015). It is not clear how these team work questions could be used in other systems because there is no clear guidance for replicating the question generation process. A different approach was the conceptual development of the four resilience abilities (Rigaud et al, 2015). Rigaud et al (2015) suggest it useful to explore responding, monitoring, learning and anticipating in more detail and expand the four resilience abilities into nine resilience dimensions. This expansion focuses on analysing a time dimension of the four resilience abilities, for example system capacity to monitor past performance, system capacity to monitor actual performance and system capacity to monitor potential (future) performance

(Rigaud et al 2015). This idea was presented in a conference proceeding with no methodological guidance for applying it in practice and there is no evidence of further any further development.

In summary, the RAG is conceptually well-developed because there is a clear link between the four resilience abilities and analysing organisational resilience. It is one of the most commonly used methods for analysing organisational resilience (Nemeth et al, 2017), and there have been many applications in healthcare (Axelsson & Ros, 2015; Chuang, 2015; Hunte, 2016; Engvall et al, 2017). However, the original questions are abstract, couched in technical language that is inaccessible to people not well versed in resilience engineering theory and fail to adequately represent the social elements of resilient system performance. The implementation gap is the most significant limitation for the method and has resulted in different ways of generating questions (Praetorius et al, 2012; Chuang, 2015). There is currently no consensus around how to generate questions, with most attempts editing the original questions to suit their system. Attempts at developing this method have thus far failed to demonstrate sufficient evidence of improving its ability to analyse organisational resilience (Van der Beek & Schraagen, 2015; Rigaud et al, 2015). For the RAG, bridging the implementation gap is a clear direction for improvement. Doing this effectively should generate questions that are not limited in the same way as the original questions.

2.4.2 Resilience Markers Framework

The Resilience Markers Framework (RMF) structures observations of resilient actions in small teams (Furniss et al, 2011a). However, the term ‘small teams’ is not clearly defined. The framework was developed in response to a lack of common frameworks for analysing organisational resilience, which limited the ability of the resilience engineering field to build on previous work (Furniss et al, 2011a). The RMF provides a platform for discussion of organisational resilience, where specific activities observed in practice (in a particular system) are traced to high-level resilience concepts (across different systems in different industries). For example, an operator in a nuclear power station control room was observed putting a

bookmark in an operation manual in anticipation of a particular future event (Furniss et al 2011a). This action is specific to the nuclear power domain, however the RMF structures analysis of this action so that it relates to higher-level resilience concepts, such as anticipation, and this is relevant to different systems in different industries, for example managing discharges in a hospital.

There are three parts to the framework (Figure 2-4). The first part of the framework is the observation level, which is about observing actions in practice. The second part of the framework is the strategy level, which is about analysing the actions from various perspectives to construct a resilience narrative. The third part of the framework is the markers level, which is about moving from the resilience narrative to higher level resilience concepts that are relevant to different systems and industries. The intention is to populate these categories with information gathered from observing the actions of people working in complex systems (Furniss et al, 2011a). The structure of the framework allows for the observation to capture the social as well as the technical actions associated with resilient performance.

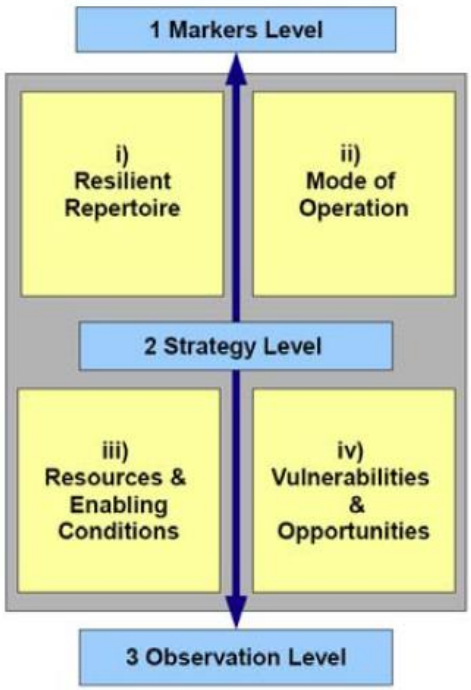

Figure 2-4 The Resilience Markers Framework (Furniss et al, 2011a)

Researchers have used the RMF to structure observation of resilient activities in several different industries, such as nuclear power (Furniss et al 2011a), healthcare (Furniss et al, 2011b; Gregg et al, 2014) and air traffic management (Stroeve et al, 2015). These applications all focus on teams based in the same location, such as a nuclear power control room (Furniss et al, 2011a), chemotherapy day unit (Furniss et al, 2011b), or air traffic control tower (Stroeve et al, 2015). They all suggest the RMF helped explain and understand more about resilient performance. For example, the anticipating activities used by nuclear power control room operatives was useful for explaining how anticipating is part of resilient performance (Furniss et al, 2011a). The adaptations of nursing staff using intravenous infusion pump alarms for monitoring, in addition to administering chemotherapy drugs, was useful for explaining how technology can be used for more than one purpose, in this instance monitoring and treatment (Furniss et al, 2011b). However, no one has used the RMF to move from understanding resilient performance to analysing resilient performance because it is an observational tool, not an analytical tool. It is useful for observing small teams that are co-located, for example in an air traffic control tower or nuclear power control room. However, in healthcare there are often multiple teams of different healthcare disciplines caring for a single patient. It is in the complexity of the interaction and coordination of these teams that many nuanced aspects of organisational resilience lie.

There have been some attempts to develop the RMF so that it can analyse resilient performance. One attempt was to develop a framework for learning from adaptive performance (Rankin et al, 2014a). This focused on cataloguing examples of resilient actions. However, this is limited in the same way as the RMF. It does not provide any support for moving beyond observation to evaluation. Another attempt to develop the RMF was the framework for analysing adaptations (Rankin et al, 2014b). This explicitly focuses on analysing resilient strategies employed in everyday work (Figure 2-5). The framework consists of three categories of analysis: contextual analysis, enablers of resilient actions and interactions (expected and unexpected) of resilient actions with other parts of the system (Rankin et al, 2014b).

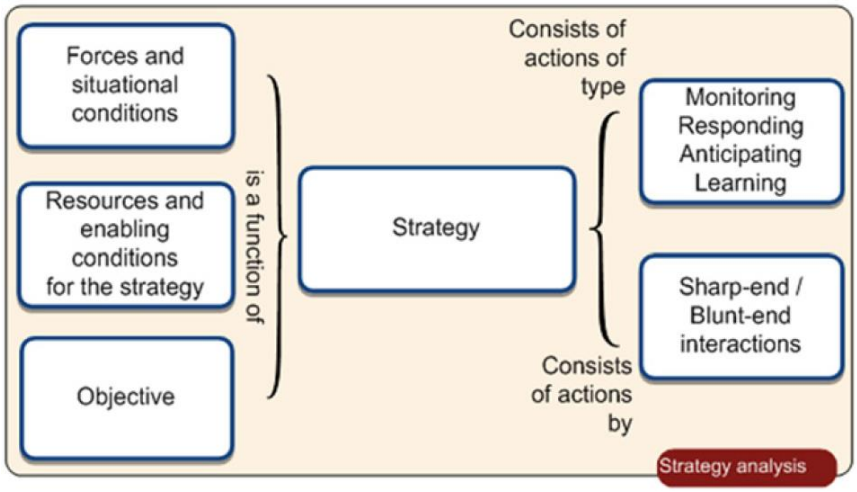

Figure 2-5 Resilient Strategies Framework (Rankin et al, 2014b)

There are several different conceptual elements to this framework, including the observational structure of the RMF (Furniss et al, 2011a), the four resilience abilities (Hollnagel, 2010) and other resilience engineering theoretical components (Hollnagel et al, 2006). Although these are all relevant to analysing organisational resilience, they involve different elements of resilience engineering theory and there is no clear explanation about how they interact within this framework. Consequently, there is a lack of conceptual clarity. There is also insufficient detail for using this framework in practice.

The RMF is conceptually sound, but only supports observing resilient actions of small teams, rather than analysing resilient system performance. Despite attempts by others to develop the RMF into an analytical framework (Rankin et al, 2014b), the lack of conceptual clarity and insufficient methodological development meant they are also of limited value for analysing the organisational resilience of healthcare systems.

2.4.3 Functional Resonance Analysis Method

The Functional Resonance Analysis Method (FRAM) provides a way to describe how work is done in complex systems using the idea of resonance arising from the variability of everyday performance (Hollnagel, 2016b). It is underpinned by four concepts, which inform a well-established method for modelling complex systems (Hollnagel, 2012). These four concepts are;

things go right and wrong in the same way, adaptation is necessary for successful performance and this is the source of why things go right or wrong, normal variability of several functions can combine in unexpected ways, this variability can resonate and result in unusually high variability of normal functions (Hollnagel, 2012). The intention of a FRAM analysis is to produce a description of how system components interact, so that unwanted variability can be identified and reduced (Hollnagel, 2016b).

However, unwanted variability is not well defined. It appears to be a post-hoc designation similar to human error and is used to retrospectively describe human actions that have negative outcomes. If this is the case, then post-hoc designations cannot inform a prospective method for analysing organisational resilience because these judgements can only be made retrospectively.

A FRAM analysis consists of four steps. The starting point is a description and understanding of what happens in everyday work situations (Hollnagel, 2016b). The focus should be to identify all the elements that are part of important functions, rather than attempt a wider description of events. This includes identifying all the aspects that are essential for that function to be carried out: time, control, output, resource, precondition and input. (Hollnagel, 2016b). These are the conditions that allow the function or activity to happen. Figure 2-6 shows an example of the hexagons that FRAM uses to model the six aspects of a function (or activity). Second, identify the potential variability of the functions in the FRAM model. Third, define the functional resonance based on dependencies between functions and the potential for functional variability. Once this analysis is complete, then it is possible to identify ways to monitor resonance between the variability of system functions, to reduce unwanted variability (leading to poor outcomes) or increase desired variability (leading to good outcomes) (Hollnagel, 2016b). There is computer software to support the development of these system models (Hollnagel, 2016a).

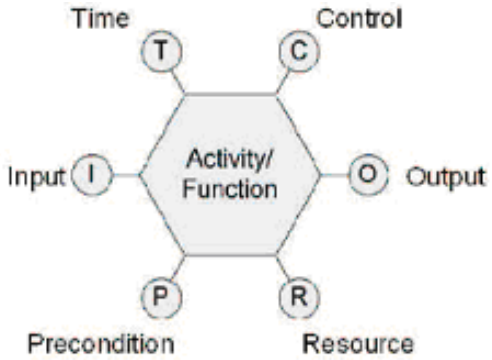

Figure 2-6 The six aspects of a function or activity in a FRAM module (Hollnagel, 2012)

FRAM has been used for different types of analyses across a range of industries. It has been used in healthcare to analyse effectiveness of systems and processes. For example, it has been used to analyse the ability of a primary care system to identify and manage sepsis (McNab et al, 2018). Figure 2-7 shows an example of this FRAM model and how the connections between the hexagons combine to model a primary care system (McNab et al, 2018). It has also been used to align Work-as-Imagined and Work-as-Done when implementing clinical guidelines (Clay-Williams et al, 2015). Beyond healthcare, it has been used to explore accidents in air-traffic management systems (De Carvalho, 2011), model maritime organisation systems (Patriarca & Bergström, 2017) and assess risk in sustainable construction industries (Rosa et al, 2015). This range of analyses shows that FRAM is not limited to analysing organisational resilience, but that the method allows for a variety of different analyses (Hollnagel, 2016a).

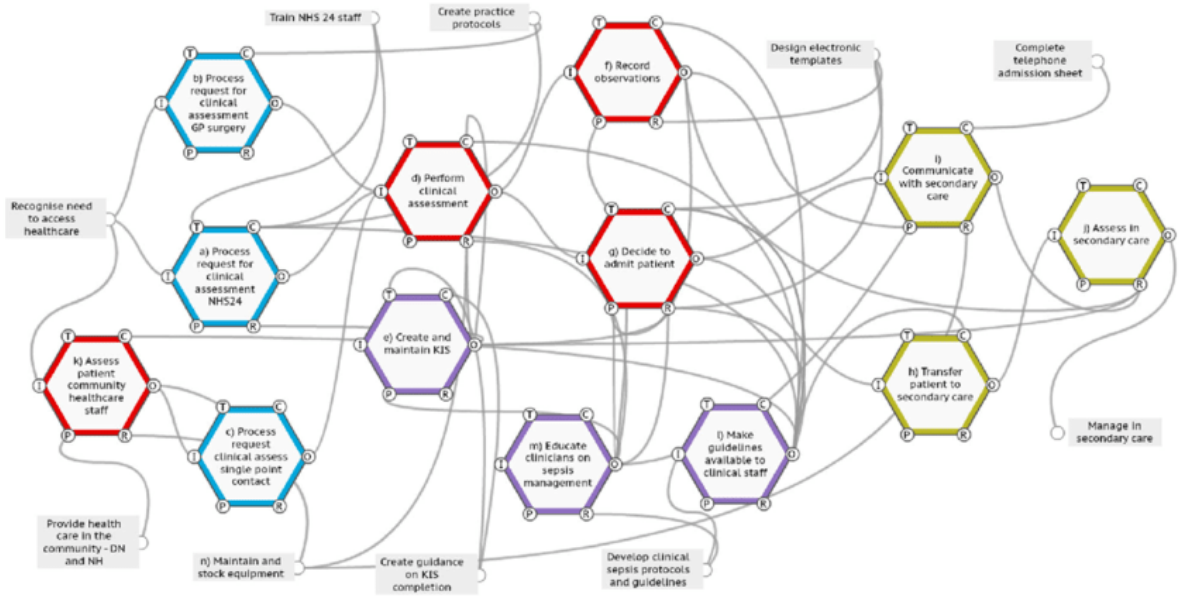

Figure 2-7 FRAM model of system to identify and clinically manage sepsis in primary care (McNab et al, 2018)

There have been several attempts at improving FRAM. One attempt focused on improving FRAM's ability to analyse organisational resilience, by using FRAM to analyse Woods' (2006) five resilience characteristics (Woltjer, 2008). The intention is that the detail of the FRAM model could provide some direction for analysing vague resilience characteristics, such as flexibility and cross-scale interactions (Woods, 2006). However, this is a conference proceeding and it is not clear whether this analysis should be completed for each new system being investigated, or whether it is supposed to provide more general guidance about analysing organisational resilience. There is no evidence that this provided further value for using FRAM to analyse organisational resilience. A different attempt at developing FRAM is the Resilience Analysis Matrix (RAM) (Lundberg & Woltjer, 2013). This is about developing the output of FRAM analyses and improving the way the findings are visualised. RAM provides a visual representation of the functional dependencies in complex systems and can represent system behaviours in ways that textual analysis cannot (Lundberg & Woltjer, 2013). This is another conference proceeding with little methodological development nor application in practice.

FRAM is a conceptually clear, methodologically well-developed method analysing variability between system functions. The FRAM model provides a platform for understanding how system components interact and informs a range of different analyses, including, but not limited to

analysing organisational resilience. Attempts at developing FRAM did not provide any evidence that they increased the value of the method (Woltjer, 2008; Lundberg & Woltjer, 2013).

2.4.4 Leading Indicator Approaches for Analysing Organisational Resilience

A further approach extends to methods that have used a leading indicator approach for analysing organisational resilience (Table 2-4). Leading indicators are conditions that precede an event and have value in predicting the arrival of this event (Grabowski et al, 2007). They are distinct from lagging indicators, which identify conditions that have contributed to an event but are only recorded or understood after the event has occurred (Leveson, 2015; Kongsvik et al, 2010). The intention of leading indicator informed approaches is to proactively identify when system performance is deteriorating and no longer able to adapt to expected or unexpected demands (Grabowski et al, 2007; Rubio-Romero et al, 2018). In this way, they assess organisational resilience as system performance occurs. There are four different ways researchers have used leading indicators to assess organisational resilience, including analysing the effect adaptations have on outcomes (Øien et al, 2010; Grecco et al, 2013; Raben et al 2017), using pre-existing models to identify leading indicators (Herrera et al, 2013), assessing system performance in relation to system boundaries (Siegel & Schraagen, 2014) and using leading indicators to support quantitative assessment of organisational resilience (Shirali et al, 2015; Rubio-Romero et al, 2018).

Table 2-4 Leading Indicator Methods for Analysing Organisational Resilience

Reference	Underlying Concepts	Method	Domain	Application
Øien, K., Massaiu, S., Tinmannsvik, R., Størseth, F. (2010). Development of early warning indicators based on resilience engineering. Paper presented at *10th International Probabilistic Safety Assessment & Management Conference*. Seattle, Washington.	Resilience early warning indicators are a way to understand the effectiveness of proactive risk management practices Leading indicator approaches to analysing organisational resilience should focus on the effect adaptations have on outcomes	Three main categories of contributing success factors for resilient system performance: risk awareness, response capacity, support Each factor has specific indicators which can be measured	Oil and Gas Industry	Exploratory study for reducing risk of oil spills
Grecco, C., Vidal, M., Cosenza, C., Santos, I., & Carvalho, P. (2013). A Fuzzy Model to Assess Resilience for Safety Management. Paper presented at *5th Resilience Engineering Association Symposium*. *Managing Trade-Offs*. Soesterberg, Netherlands	Analysing organisational resilience should be concerned with the anticipation and monitoring of trade-offs Leading indicator approaches to analysing organisational resilience should focus on the effect adaptations have on outcomes	Three steps to assess organisational resilience: selection of the leading indicators, determination of resilience ideal pattern (using Fuzzy Set Theory), assessment of actual resilience level compared to ideal pattern	Healthcare	Exploratory study at radiopharmaceuticals dispatch system .

Herrera, I, A., Vennesland, A., Pasquini, A., & Silvagni, S. (2013). Planning Measuring Resilience Potential and Early Warnings (SCALES). Paper presented at *5th Resilience Engineering Association Symposium. Managing Trade-Offs.* Soesterberg, Netherlands.	Organisational resilience can be analysed using existing system models. A detailed system model, using several perspectives, can identify indicators of resilient performance	Detailed system model should include functional, process, information and role perspectives. Uses Woods' (2006) resilience characteristics and Hollnagel's (2010) four resilience abilities	No Application in practice	Conference paper
Siegel, W., & Schraagen, J. (2013). Developing Resilience Signals for the Dutch Railway System. Paper presented *at 5th Resilience Engineering Association Symposium. Managing Trade-Offs.* Soesterberg, Netherlands.	Organisational resilience can be analysed by quantifying resilience signals Leading indicators can be developed to indicate the status of current system performance in relation to system boundaries	Railway industry technical data are used to construct a series of equations that calculate quantified resilience signals Informed by Hollnagel's (2010) four resilience abilities, with a focus on anticipating	Railway industry	Two retrospective case studies
Shirali, G. A., Motamedzade, M., Mohammadfam, I., Ebrahimipour, V., & Moghimbeigi, A. (2016). Assessment of resilience engineering factors based on system properties in a process industry. *Cognition, Technology & Work,* 18(1), 19-31.	Organisational resilience should be assessed quantitatively. This should be done using statistical methods - Principal Component Analysis (PCA) and Numerical Taxonomy (NT)	PCA and NT are used to assess nine leading indicators of resilient performance: buffering capacity, margin, tolerance, cross-scale interactions, learning culture, flexibility, anticipation, attention, response	Chemical process plant	Case study at a chemical process plant

Raben, D., Bogh, S., Viskum, B., Mikkelsen, K. L., & Hollnagel, E. (2017). Proposing leading indicators for blood sampling: application of a method based on the principles of resilient healthcare. *Cognition, Technology & Work,* 19(4), 809-817.	Leading indicator approaches to analysing organisational resilience should focus on the effect adaptations have on outcomes	The Leading Indicator Identification Method (LIIM). Six steps for identifying system functions, the variability of functions and leading indicators of this variability	Healthcare	Case study of blood sampling in an outpatient clinic
Rubio-Romero, J., Pardo-Ferreira, M., De la Varga-Salto, J., & Galindo-Reyes, F. (2018). Composite leading indicator to assess the resilience engineering in occupational health & safety in municipal solid waste management companies. *Safety Science*, 108, 161-172.	Organisational resilience can be quantified and assessed using composite leading indicators Quantifying resilience assessment is important for informing decisions about improving system resilience	The Composite Leading Indicator method - 61 variables corresponding to the 61 items from a questionnaire designed by Shirali et al (2013) to evaluate resilience engineering	Municipal Solid Waste Management	Case Study of occupational health and safety management in solid waste company

The most common approach utilised for a leading indicator informed method for analysing organisational resilience is to assess the effect adaptations have on outcomes. However, there is no consensus about how this should be done. For example, one method uses FRAM to map system processes, then identify adaptations and find indicators for how these adaptations affect system performance (Raben et al, 2017). This was applied to a healthcare system and explored indicators for resilient performance in a blood sampling clinic. Although this method is helpful for identifying indicators, there is little work undertaken into how to support the system to monitor these indicators. For example, delays in receiving the results of blood tests are an indication of deteriorating system performance. However, there is no further suggestion for developing system level monitoring for this leading indicator. This has arguably limited the ability of this method to analyse organisational resilience in healthcare. A different method focuses on identifying contributing success factors, which are specific activities or system properties that are indicators of resilient system performance (Øien et al, 2010). The activities or system properties that represent the contributing success factors are specific to each complex system, however this provides little guidance for identifying these in practice. Some approaches use technical, reductive methods to identify the effect adaptations have on outcomes. For example, one method uses fuzzy set mathematical theory to identify an ideal resilient system performance and then assess actual system performance compared to this ideal model (Grecco et al, 2013). Fuzzy set theory is mathematical theory which focuses on modelling vague concepts with unclear boundaries (Massad et al, 2008). The intention is to use this theory to provide some structure to exploring resilient performance and understand how current system performance relates to an idealised version of system performance. The technical nature of this approach means that it failed to account for any social aspect of system performance. There is also insufficient methodological detail for identifying the ideal resilient system performance in another complex system.

Rather than develop new conceptual approaches, some researchers use pre-existing system models to inform a leading indicator method for analysing organisational resilience. For example, one approach uses a combination of existing system modelling techniques, Woods'

(2006) resilience characteristics and Hollnagel's (2010) four resilience abilities to build a detailed model of system performance (Herrera et al, 2013). The intention is to use the detailed system model to identify leading indicators of resilient performance, so that the effectiveness of system performance could be understood in real time. However, this is a conference proceeding and only provides a conceptual outline of a method. There is insufficient conceptual or methodological detail for using this method in practice. There is no explanation about how the different elements of resilience engineering theory interact with each other to analyse organisational resilience.

A leading indicator approach has also been used to identify the status of system performance in relation to system boundaries. The only example of this is specific to railway systems (Siegel & Schraagen, 2014). For this method, system boundaries are defined as a combination of safety culture pressure, efficiency pressure and 'least effort' pressure (Rasmussen, 1997). These are the forces that surround a complex system and affect system performance. Understanding the status of system performance in relation to these boundaries provides a means to analyse resilient system performance (Siegel & Schraagen, 2014). This method involves quantifying resilience signals, which are observable elements of a system that indicate its ability to respond to expected and unexpected events (Siegel & Schraagen, 2014). It focuses on railway systems because railways systems have a specific nature and architecture where it is useful to define and quantify system boundaries (Siegel & Schraagen, 2014). The examples discussed in the paper are so specific to a railway industry setting that it is difficult to understand how this approach for developing leading indicators could be applied to another domain. Engineered systems, with more tightly controlled and predictable system components, such as nuclear power stations or railways do not behave in the same way as healthcare systems (Furniss et al, 2011b; Siegel & Schraagen, 2014). Healthcare systems are more dynamic, less predictable and this means it is less valuable to look at system performance in relation to system boundaries (Hollnagel et al, 2013; Wears et al, 2015).

There are several leading indicator approaches which explicitly use quantitative methods to analyse organisational resilience. For example, one approach uses several statistical methods

to analyse a series of resilience indicators in a chemical process plant (Shirali et al, 2015). The resilience indicators are informed by Woods' (2006) resilience characteristics. The intention is that these indicators represent elements of resilience system performance and by measuring them with quantitative methods it is possible to derive a resilience score. Another quantitative approach is to evaluate composite indicators of system performance (Rubio-Romero et al, 2018). These composite indicators represent 61 variables of resilient system performance (Shirali et al, 2013). These composite leading indicators are assigned different weights according to their value for the system they are in. Both of these quantitative approaches (Shirali et al, 2013; Rubio-Romero et al, 2018) suggest that calculating scores of resilient performances is useful for decision makers in large, complex systems. However, this appears to be directly opposed to the core beliefs of the resilience engineering community about the value of measuring resilient performance (Hollnagel et al, 2006; Hollnagel, 2010). Reducing analysis of organisational resilience to numerical values fails to grasp the explanatory power of the resilience engineering lens of understanding system performance (Hollnagel et al, 2015).

The effect of deploying these different approaches has not, however, resulted in a consensus for using leading indicator informed approaches for analysing organisational resilience. Consequently, there are a range of conceptual and methodological perspectives. When there was no conceptual clarity, there was no methodological clarity. This suggests that beyond the core idea of leading indicators, there is no real progress for these approaches. There seems to be an explicit assumption that monitoring the leading indicators is straight forward, however none of the approaches provide any methodological guidance for how to monitor indicators in practice. It is not clear therefore, whether there needs to be a prepared response for a leading indicator approach to be useful, nor how this prepared response might be developed. Leading indicator approaches remain at an early stage of development and although many are well aligned with resilience engineering theory, they have not yet been sufficiently developed to analyse organisational resilience in healthcare. There are accounts of informal leading indicator strategies used by healthcare professionals in isolated healthcare systems (Miller & Xiao, 2007), which suggests there is value in this approach. However, there is no evidence about how to build these informal strategies into a system wide approach.

2.4.5 Other Methods for Analysing Organisational Resilience

The remaining methods for analysing organisational resilience are a series of isolated approaches that do not share any significant characteristics with the established RAG, RMF, FRAM methods or leading indicator approaches. Table 2-5 presents an overview of these approaches.

Table 2-5 Articles in 'Other' section of findings in narrative review

Paper	Underlying Concepts	Method	Domain	Application
Woods, D., Wreathall, J. & Anders S. (2006) Stress-Strain Plots as a Model of an Organisation's Resilience. Paper presented at the *2nd Resilience Engineering Association Symposium*, France.	An analogy can be drawn between the behaviour of material experiencing stress and the behaviour of a complex socio-technical system experiencing stress. This analogy can inform understanding and assessment of system resilience	A stress-strain model can be developed to inform understanding adaptations in complex socio-technical systems	No specific domain	No application in practice
Woods, D. & Wreathall, J. (2008). Stress-Strain Plots as a Basis for Assessing System Resilience. In. Hollnagel, E., Nemeth C. & Dekker S. (Eds). *Resilience Engineering Perspectives, Volume 1: Remaining Sensitive to the Possibility of Failure*. Ashgate.	An analogy can be drawn between the behaviour of material experiencing stress and the behaviour of a complex socio-technical system experiencing stress. This analogy can inform understanding and assessment of system resilience	A stress-strain model can be developed to inform understanding adaptations in complex socio-technical systems	No specific domain	No application in practice
Woods, D., Chan, Y. J., & Wreathall, J. (2013). The Stress Strain Model of Resilience Operationalizes the Four Cornerstones of Resilience Engineering. Paper presented at *5th Resilience Engineering Association Symposium*. *Managing Trade-Offs*. Soesterberg, Netherlands.	An analogy can be drawn between the behaviour of materials experiencing stress and the behaviour of a complex socio-technical system experiencing stress. This analogy can inform assessment of system resilience	A stress-strain model can analyse Hollnagel's (2010) four resilience abilities to inform understanding adaptations in complex socio-technical systems	No specific domain	No application in practice
Mendonça, D. (2008). Measures of Resilient Performance. In. Hollnagel, E., Nemeth C. & Dekker S. (Eds). *Resilience Engineering Perspectives, Volume 1: Remaining Sensitive to the Possibility of Failure.* Ashgate, UK.	Organisational resilience is most salient during extreme events and this is where measurement should focus	Discussion of examples of resilience performance Application of Woods' (2006) resilience characteristics to a retrospective case study	Electric power /telecommunications company responding to the 2001 World Trade Centre attacks	Discussion of examples of resilient practice
Mendonça, D. & Wallace, W. (2015). Factors underlying organizational resilience: The case of electric power restoration in New York City after 11 September 2001. *Reliability Engineering & System Safety*, 141, 83-91.	Organisational resilience is most salient during extreme events and this is where measurement should focus	Discussion of examples of resilience performance Addition of 'boundary-spanning capability' to Woods' (2006) resilience characteristics	Electric power /telecommunications company responding to the 2001 World Trade Centre attacks	Discussion of examples of resilient practice

Ferreira, P., Wilson, J., Ryan, B., & Sharples, S. (2010). Measuring Resilience in the Planning of Rail Engineering Work. In. Hollnagel, E., Paries, J., Woods, D., & Wreathall, J. (Eds). *Resilience Engineering in Practice: A Guidebook*. Ashgate Publishing. Farnham, UK.	Organisational resilience can be used to assess the preparedness of a system, not only to respond to unforeseen (and unforeseeable) events, but also to manage known threats and pressures	Questionnaire assessing the organisational resilience in the planning of rail engineering work. Application of Woods' (2006), Wreathall's (2008) and Mendonca (2008) resilience characteristics	Railway Industry	Application of questionnaire to measure the organisational resilience in the planning of rail engineering work
Saurin, T., & Junior, G. (2012). A Framework for Identifying and Analyzing Sources of Resilience and Brittleness: a Case Study of Two Air Taxi Carriers. *International Journal of Industrial Economics*, 42 (3), 312-324.	Sources of system resilience (SR) and sources of system brittleness (SB) should be analysed alongside each other. Analytical framework should not be constrained to a single unit of analysis, e.g. teams. They should be able to analyse organisational resilience across different levels.	Framework for identifying and analysing sources of SR and SB. This involves describing the system to identify sources of SR and SB, then analysing those sources.	Air Traffic Management	Two retrospective case studies of air traffic control episodes
Saurin, T. (2015). Classification and Assessment of Slack: Implications for Resilience. Paper presented at *6th Resilience Engineering Association Symposium*. Lisbon, Portugal.	Slack can provide resources for dealing with both expected and unexpected variability. However, in complex systems slack interacts with other elements, and this can have unintended consequences. Assessing system slack is a way of assessing its ability to respond to expected and unexpected events.	Discussion of ten classifications of slack - origin, nature of the resources, availability, strategy of deployment, tolerance, visibility, side-effects, rate of degradation, breadth, hierarchy	Healthcare	Inpatient pharmacy

Saurin, T. & Werle, N. (2017). A framework for the analysis of slack in socio-technical systems. *Reliability Engineering and System Safety*. 167, 439-451.	Slack may either be designed, which usually occurs in tightly-coupled systems, or opportunistic, which usually occurs in loosely-coupled systems. Assessing system slack is a way of assessing its ability to respond to expected and unexpected events.	Eleven step process for identifying and assessing slack.	Healthcare	Maternity ward
Francis, R. & Bekera, B. (2014). A metric and frameworks for resilience analysis of engineered and infrastructure systems. *Reliability Engineering & System Safet*y, 121, 90-103.	Resilience is a property of a system that is capable of effectively combatting disruptive events. A risk modelling approach can be used to inform the design of a system so that they are able to perform in a resilient manner.	Resilience analysis framework focuses on identifying resilience capacities of a system. Application of resilience analysis framework generates a resilience metric.	Electric power company	Applied to a fictional city setting
Azadeh, A., Salehi, V., Arvan, M. & Dolatkhah, M. (2014). Assessment of resilience engineering factors in high-risk environments by fuzzy cognitive maps: A petrochemical plant. *Safety Science*, 68, 99-107.	Quantitative assessment of organisational resilience could help management level teams make decisions about improving safety in complex systems. Fuzzy Cognitive Maps (FCMs) method considers interactions between system factors according to their calculated weights.	The results of FCMs are combined with a set of questionnaire results to enhance the accuracy of their final weights. Focuses on resilience characteristics of: management commitment, reporting culture, learning culture, awareness, preparedness, flexibility, teamwork, redundancy, fault-tolerant	Petrochemical industry	Petrochemical plant

Stroeve, S. & Everdij, M. (2017). Agent-based modelling and mental simulation for resilience engineering in air transport. *Safety Science*, 93, 29-49.	Qualitative agent based modelling and simulation (ABMS) provides a structured analysis of organisational resilience. An agent-based model of a sociotechnical system describes the performance and interactions of its constituent human operators and technical systems in an operational context	Qualitative ABMS includes the development of an agent based model and uses "mental simulation" to identify relations and dynamics between agents' states. Quantitative ABMS includes development of a formal model using computer simulation.	Air Traffic Management	Two case studies about how sudden bad weather conditions influences aircraft approach operations
Jain, P., Mentzer, R., & Mannan, M. S. (2018). Resilience metrics for improved process-risk decision making: Survey, analysis and application. *Safety Science*, 108, 13-28.	Quantitative data driven approach to analysing organisational resilience Quantitative information about organisational resilience is useful for various risk assessors and decision makers	Process Resilience Analysis Framework (PRAF) is a method of risk assessment with three phases – avoidance; survival; and recovery. This includes twenty-four resilience metrics covering both technical and social aspects of system performance	Process Industry	Case study

Several methods are heavily influenced by systems engineering perspectives. For example, one approach focuses on identifying sources of system resilience and system brittleness (Saurin & Junior, 2012). This is a case study of two examples in air traffic management settings. It is largely conceptual, with little methodological detail and is an example about how systems engineering perspectives can inform methods for analysing organisational resilience. Another example of a systems engineering approach is a method for identifying and analysing 'slack' (spare resources that can be called on in times on need) (Saurin, 2015; Saurin & Werle, 2017). The method focuses on classifying the different elements of 'slack' and analysing their availability for system performance, to understand how they can support resilient system performance. There are two examples of this being used in healthcare and they identify how different personnel are available in different parts of the hospital, who could be extra support to respond to unexpected system disturbances, despite not being part of the planned response (Saurin, 2015; Saurin & Werle, 2017). Systems engineering is an established field focused on the design and management of complex systems over their life cycles (Checkland, 1981). Although there are similarities between systems engineering and resilience engineering, they are distinct disciplines. The systems engineering methods for analysing organisational resilience (Saurin & Junior, 2012; Saurin, 2015; Saurin & Werle, 2017) are all highly technical and reductive perspectives for understanding and analysing complex systems. They cannot account for the social elements of resilient system performance. Consequently, they are of limited value for analysing organisational resilience in healthcare.

There are also several quantitative methods for analysing organisational resilience. Like the systems engineering methods, these are technical and focus on producing resilience metrics. For example, one method uses fuzzy cognitive maps to quantify resilient performance (Azadeh et al, 2014). Fuzzy cognitive maps are used to model decision making in complex systems (Kosko, 1986). The justification for use is that quantitative data provides information that is more useful for decision makers than qualitative data. However, the resilience characteristics at the centre of the model are vague (Woods, 2006) and it is not clear how quantifying these vague resilience concepts is useful, conceptually, for analysing organisational resilience. A different quantitative method for analysing organisational resilience uses a resilience analysis framework to generate a resilience metric (Francis & Bekera, 2014). This analysis framework involves many different components, none of which appear to align with

the central concepts of resilience engineering theory. So, the resilience metrics are not representing the core elements of resilience engineering theory. There is limited guidance for applying this theory in practice. Quantitative methods for analysing organisational resilience are also informed by risk assessment processes (Jain et al, 2018). This risk assessment process involves three stages: avoidance, survival and recovery. Although Jain et al (2018) use the resilience engineering theoretical lens, they subsume it into a wider framework for understanding complex systems which includes business impact and system architecture. By doing so, they widen the scope of their framework beyond resilience engineering theory and fail to align with the core resilience concepts, such as focusing on everyday clinical work, and the distinction between Work-as-Imagined and Work-as-Done. The quantitative methods for analysing organisational resilience justify their methods for the ease of which quantitative data can inform decisions (Azadeh et al, 2014; Jain et al, 2018). By using such reductive methods, they fail to reach the deep, nuanced understanding of system performance advocated by resilience engineering theory. These methods are highly technical, with limited guidance on how to apply them in practice.

On the other hand, there are also highly conceptual, abstract methods for analysing organisational resilience. Some of these approaches originate from an early stage in the development of the resilience engineering field where the ideas were much more diffuse (Hollnagel et al, 2006; Hollnagel et al, 2008). For example, one approach uses a metaphor from material science to map the behaviour of complex systems under stress onto the behaviour of materials under stress (Woods et al, 2006; Woods & Wreathall, 2008). The intention is that the science of understanding how materials bend and eventually break under pressure could inform understanding of how complex systems bend and eventually fail under pressure. However, there is no clear suggestion for using this in practice. Despite further work attempting to provide a more robust method (Woods et al, 2013), there is still little improvement beyond this approach as a metaphor for analysing resilient performance. Another conceptual approach to measuring organisational resilience is to explore how early resilience concepts, such as Woods' (2006) resilience characteristics, could explain resilient performance in specific case studies (Mendonça, 2008; Mendonça & Wallace, 2015). These are little more than discussions about how to approach analysing resilient performance and provide no methodological guidance for using them in practice.

There are also a series of individual frameworks and methods developed in isolation, used once and rarely applied again. Many use existing systems models to provide structure for analysing organisational resilience. For example, one approach uses a risk management lens to analyse organisational resilience and employs a method to analyse how well the functions of risk management are carried out (Wreathall, 2009). It is not clear how a risk management lens can analyse organisational resilience. This comes from one of the early resilience engineering books (Nemeth et al, 2009) where researchers are still grappling with how to use resilience engineering ideas in practice. This work is not developed any further and there are no examples of it being used by other researchers in practice. Another approach is to use agent-based modelling to analyse organisational resilience (Stroeve & Everdij, 2017). An agent-based model of a sociotechnical system describes the performance and interactions of the people that work in it with technical systems in an operational context (Stroeve & Everdij, 2017). Although this appears to align with the some of the central ideas of resilience engineering theory, it is another highly technical, reductive modelling technique. Like Wreathall (2009), there appears to be little further conceptual or methodological development of this method.

Not all these approaches use pre-existing system models or other theoretical perspectives. Some researchers developed new models, directly informed by resilience engineering theory, to measure organisational resilience. For example, the 'quick and dirty' method focuses on evaluating the resilience enhancing properties of the system (Johansson & Lindgren, 2008). However, there is no clear suggestion for how these resilience enhancing properties should be identified in a new system. Some approaches use conceptual frameworks that are so specific to particular domains, they are irrelevant to analysing organisational resilience in healthcare. For example, one method focuses on measuring resilience in the planning of rail engineering work (Ferreira et al, 2010). This involves a series of resilience engineering conceptual approaches from Woods (2006), Wreathall (2009) and Mendonça (2008). There is no attempt at making this generalisable to other domains and it is only relevant to the railway industry.

None of these methods are useful for informing a method to analyse organisational resilience in healthcare. Most of them are either too abstract and conceptual (Woods et al, 2006; Mendonça, 2008), or technical and quantitative (Francis & Bekera, 2014; Jain et al, 2018). Many of them represent

attempts at using pre-existing frameworks (Wreathall, 2009) or theoretical lenses (Saurin & Werle, 2017), without any evidence of adding further value to the resilience engineering theoretical lens of understanding performance in complex sociotechnical systems. Furthermore, none of these approaches demonstrate sufficient conceptual clarity, methodological guidance, application in practice or representation of social elements of system performance to be considered useful for analysing organisational resilience in healthcare.

2.5 Discussion

Despite its recent origins (Hollnagel et al, 2006), there has been a plethora of different conceptual and methodological approaches for using the resilience engineering theoretical lens to understand performance in complex sociotechnical systems (Berg et al, 2018; Patriarca et al, 2018). However, there are only a few established methods for analysing organisational resilience that have been used in practice (Hollnagel, 2010: Furniss et al, 2011a; Hollnagel, 2012). Most of the other methods identified in the review, particularly from the early stages of the development of the resilience engineering field, are suggestions about how this theoretical lens could be explored in practice (Woods et al, 2006; Mendonca, 2008). These early methods demonstrate moderate conceptual clarity, but poor methodological guidance and are varied in how well they represent the social elements of system performance. Yet, as the field has developed, they have been set aside as theoretical cul-de-sacs, and this means they are rarely applied in practice. There have been frequent attempts at linking the resilience engineering theoretical perspective with models and methods from other fields, to gain some leverage for using this concept in practice (Wreathall, 2009; Saurin & Junior, 2012; Azadeh et al, 2014; Jain et al, 2018). However, this rarely turns out to be useful because they fail to effectively align with the nuances of resilience engineering theory and lack conceptual clarity. Early attempts at developing methods are mainly found in the resilience engineering book series and Resilience Engineering Association symposia. However, as the identity of the field has become more established, the wider scientific community are more accepting of the resilience engineering theoretical lens and now appear more regularly in peer-reviewed academic journals (Azadeh et al, 2014; Stroeve & Everdij, 2017; Jain et al, 2018). Despite this, there is still considerable variability in the methodological guidance and representation of the social elements of system performance of these more recent methods. There now

appears to be more stability about what the central resilience engineering ideas mean (Berg et al, 2018), but there is still a need to establish methods for using them in practice (Patriarca et al, 2018).

The RAG (Hollnagel, 2010) and FRAM (Hollnagel, 2012) are the only established methods for analysing organisational resilience that have sufficient methodological development to guide their use in practice. They have both been used to analyse organisational resilience in healthcare systems (Chuang, 2015; McNab et al, 2018). However, they are both limited in their ability to represent the social elements of system performance. The RMF (Furniss et al, 2011a) is limited to structuring observation of resilient practices in small teams and therefore has limited value as a method for analysing organisational resilience in healthcare systems (Nemeth & Herrera, 2015). Despite a broad similarity in terms of their approach, there is no consensus about how leading indicator informed methods should analyse organisational resilience. The lack of conceptual clarity means there is a lack of methodological development.

FRAM is the most popular resilience engineering method for modelling and analysing complex systems. It has the most well-developed method, including specific software for developing system models, and a committed group of researchers to propagate this approach (Hollnagel, 2016b). A FRAM analysis focuses on developing a model of a system or process, then using the model to inform various analyses, such as analysing system performance, understanding accidents or implementing guidelines (Hollnagel, 2016a). Conceptually, the unclear definition of unwanted variability (discussed earlier 2.4.3, p.54) leaves some irregularity at the heart of this approach. On the other hand, the RAG represents a more fruitful approach to analysing resilient healthcare practices. It is conceptually well developed and explicitly orientated toward analysing organisational resilience (Hollnagel, 2010). However, it is methodologically limited because the original RAG questions (Appendix A, p.210) are abstract, couched in unnecessarily technical language and there is no suggestion for how they should be adapted to local contexts. Despite this, it has been applied many times in healthcare (Chuang, 2015; Hunte, 2016; Engvall et al, 2017). The original questions do not represent the social elements of system performance. However, a process for generating questions relevant to a local context could improve this. There is a clear direction for improving these methodological limitations and previous applications show that the RAG can be used in a healthcare context.

This thesis is about moving resilience engineering theory forward. To do this, the resilience engineering community should have a range of approaches for analysing organisational resilience. The FRAM has already undergone significant methodological development and testing. Its limitations have already been discussed. Conceptually, the RAG had the most promise as an alternative approach for analysing organisational resilience. However, it requires further methodological development and testing. This thesis responds to the RAG's methodological limitations, by developing a reflective process for nursing staff to analyse and improve the organisational resilience of their healthcare system. There are three-stages to this reflective process, beginning with focus groups with nursing staff to identify the challenging elements of everyday clinical work and how they manage this. Then, the researcher developed responding, monitoring, learning and anticipating questions, informed by the views of the focus group participants, to explore the views of the wider nursing population. Finally, nursing staff reflected on the results of the questions to identify potential system level interventions to improve the ability of the system to respond, monitor, learn and anticipate. The next chapter considers the methodology of the thesis and outlines the theoretical underpinning and research design.

Chapter 3 - Methodology

As discussed, the starting point for the thesis was dissecting out the limitations of the RAG method. The narrative review identified that the original RAG questions (Appendix A p.210) are abstract, technically focused and do not effectively address the social elements of resilient system performance. The biggest limitation is the lack of any established process for moving from the original RAG questions to new, specific questions for a given system. This resulted in considerable variability in how the RAG has been used in practice (Praetorius et al, 2012; Chuang, 2015; Hunte, 2016; Engvall et al, 2017).

3.1 Research Questions

The primary research questions are high-level exploratory questions, guiding the thesis towards responding to the limitations of the RAG identified in the narrative review. The secondary research questions unpack the high-level exploratory questions with more specific questions to be answered.

The primary research questions are:

How can the Resilience Analysis Grid be further developed to provide a replicable context specific process?

How can the views of healthcare staff be incorporated for analysing organisational resilience?

The secondary research questions are:

What is Work-As-Done for nurses?

How can nurses' Work-As-Done be understood in terms of the four resilience abilities?

How can the development of responding, monitoring, learning and anticipating survey items be informed by accounts of Work-As-Done?

How can the results of applying the Resilience Analysis Grid inform quality improvement?

3.2 Theoretical Underpinning

A constructivist epistemological lens guides the way this thesis explores organisational resilience with nursing staff on an Acute Medical Unit (AMU). This theoretical underpinning informs a mixed method research design, which focuses on exploring the everyday clinical work with healthcare professionals because they are the experts of their systems. There are three distinct phases to the thesis: focus groups with nursing staff to explore the challenging elements of their work, development of survey items from the focus group data to explore the wider nursing population's views about how well the AMU can respond, monitor, learn and anticipate, and finally interviews with nursing staff to reflect on the survey results and suggest system level interventions to improve the potential for resilient performance.

Despite its conceptual development, resilience engineering theory provides little insight into how organisational resilience should be explored in practice (Anderson et al, 2016; Berg et al, 2018). Organisational resilience has been described as an emergent property of system performance and can be viewed in the performance of everyday clinical work (Woods, 2006; Hollnagel, 2011; Hollnagel et al, 2015). The nature of performance in complex systems means that organisational resilience is distributed in complex ways across various system functions and activities (Anderson et al, 2016). It emerges during performance as people, processes and equipment simultaneously interact and react to meet the constantly fluctuating demands of a healthcare system. It cannot be observed or explained by any single person, process or unit (Back et al, 2017).

A philosophical world-view that can inform how to study this complex phenomenon is constructivism. Constructivism is a broad term, which has been used across many disciplines and encompasses a range of philosophical positions (Beaumie, 2010). However, it is an epistemological constructivist position that is most useful for understanding how we can study organisational resilience in healthcare. A constructivist epistemological stance maintains that knowledge, including scientific knowledge, is constructed by collective human thought, activity and interaction (Beaumie, 2010; Lenman & Shemmer,

2012; Collin, 2013). Knowledge is not a product of objective observation of the world, but of the social processes and interactions in which people are constantly engaged (Burr, 2015). This is known as intersubjectivity (Kim, 2001). As a culture or society, we construct our own versions of reality between us (Burr, 2015).

A constructivist epistemological position suggests that it is understanding the social processes and interactions between healthcare professionals and patients that we can know about resilient performance in healthcare systems. Healthcare systems are made up of healthcare professionals, patients and the clinical environment. Every healthcare professional follows a set of rules and associated practices which govern the scope of their agency. They do the best they can for their patients in these roles with the means available to them by the healthcare system. These are the processes by which healthcare professionals interact with each other, patients and the clinical environment. The complexity of system performance arises out of the dynamic relationships between agency, goals and circumstances of the healthcare professionals and patients (Onuf, 2012).

This means that studying organisational resilience in healthcare is about more than observing actions in practice. It is about understanding what healthcare professionals are doing in the context of their clinical environment and the pressures that impact them day to day. This encompasses a range of phenomena, such as individual decision making, interactions with patients and interactions with other healthcare professionals, including negotiating the tension between competing goals. The healthcare professionals that work in the system are the experts of this and it is necessary to talk to them about how they manage in their clinical environment. A further layer of complexity is that patients are at the centre of healthcare systems. They bring their own set of agency, goals and circumstances. We can know about resilient performance of healthcare systems by understanding the interaction of healthcare professionals, patients and the clinical environment.

This thesis explicitly focuses on nursing work as a lens for understanding resilient system performance. Many studies of resilient healthcare are observational studies (Berg et al, 2018). They generate knowledge of resilient system performance by observing healthcare professionals conduct their work (Wears & Perry, 2006; Ross et al, 2014; Sujan et al, 2015; Back et al, 2017). In many of these studies,

nursing work is central to resilient system performance. This is because nurses are often the most numerous healthcare discipline, have the most contact with patients and are central to facilitating the work of the multidisciplinary healthcare team (Allen & May, 2017). Through the constructivist epistemological lens of understanding organisational resilience, they are central to the processes by which we can understand resilient system performance. There is growing evidence that nurses are central to the safety of healthcare systems (Aiken et al, 2012).

The researcher recognises that focusing on one healthcare discipline is a limitation for the thesis because it runs against the grain of resilience engineering theory. The theory advocates a systems perspective for understanding performance in complex sociotechnical systems (Hollnagel et al, 2006; Hollnagel et al, 2015) and this means acknowledging the range of healthcare disciplines working in the system. However, the time and resource limitations (a single researcher) of the thesis meant that it was not possible to study all these disciplines in depth. This meant it was necessary to define manageable system boundaries to explore the research phenomenon. Rather than study many healthcare disciplines at a superficial level, this thesis focuses on nursing work to understand resilient system performance at a deeper level. The researcher's clinical experiences working as a nurse in the research setting provided insight into the challenges involving healthcare professionals in research. In particular, they were aware that fluctuating clinical demands would provide an ongoing barrier to including nurses in the research process. Additionally, much of the work in the thesis was about moving from theory to practice, focusing on one healthcare discipline allowed the researcher to ensure the explorative nature of the research was as guided as possible.

This thesis explores organisational resilience with a constructivist epistemological perspective, through a nursing lens to develop a replicable process for generating responding, monitoring, learning and anticipating questions, to respond to the methodological limitations of the RAG and develop a viable method for analysing organisational resilience in healthcare.

3.3 Research Setting

The research was conducted on an Acute Medical Unit (AMU) in a large teaching hospital in London. The AMUs are designated hospital wards specifically staffed and equipped to receive patients presenting with acute medical (as distinct from patients requiring surgical intervention) illness from Emergency Departments (EDs) or the community for assessment, care and treatment (Scott et al, 2009). They have multidisciplinary (typically doctors, nurses, physiotherapists, occupational therapists, pharmacists, social services) teams that comprehensively assess and manage both medical illness and functional disability and are often geographically co-located with emergency departments and key diagnostic services such as radiology (Bell et al, 2008). Patients are often unstable and at high risk of deterioration after initial treatment in the ED. This type of hospital unit has various titles, such Acute Assessment Unit (AAU), Acute Admissions Ward (AAW) or Medical Assessment Unit (MAU), however they all broadly refer to the same type of hospital ward (Scott et al, 2009). Following initial assessment and treatment, patients are either discharged home from the AMU or transferred to a specialty ward appropriate for their condition, usually within 72 hours of arrival (NHS Improvement, 2017a). AMUs have a high turnover of patients being admitted, transferred and discharged daily. They serve to reduce overcrowding in EDs, improve bed management and create a smoother flow of patients through the hospital (Scott et al, 2009).

The AMU in this study opened in June 2015, combining the staff from two separate AMUs in the hospital. This was part of the hospital's intention to create an 'emergency floor' with the ED, AMU, Clinical Decision Unit (CDU – an extension of the ED) all geographically co-located. The AMU in this study had sixty-two bed spaces and is organised into three zones (Figure 3-1). There are typically between twenty to thirty admissions during a twelve-hour shift. The bed spaces are organised into bays of four or five beds and individual side rooms, most commonly used for isolating infective patients, providing privacy for end of life patients and isolating aggressive or mental health patients. Nursing staff normally work twelve-hour shifts, changing between day and night shifts. The staffing allocation for the unit plans for twelve nurses and seven healthcare assistants on each shift. However, this varies on a regular basis according to the changing demands of the unit, such as short staffing due to illness or extra staffing due to confused patients needing a closer level of observation.

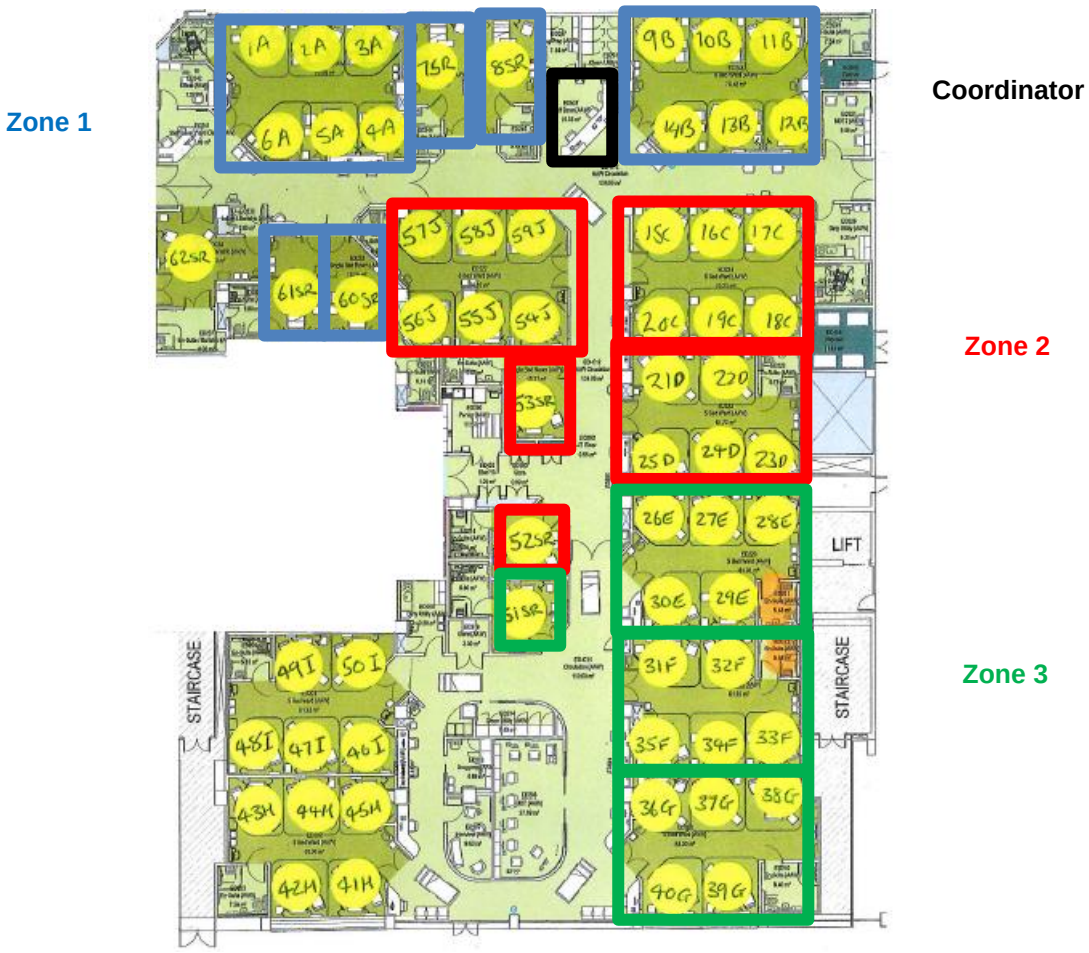

Figure 3-1 Map of the Acute Medical Unit

On each shift there is a coordinator, who oversees patient flow (admissions from ED, transfers to other wards, discharges home) and problem solving on the unit. The co-ordinator is always a senior nurse and they are not allocated any patients. Each zone has a group of nurses and healthcare assistants allocated to work in that area. One of these nurses is always the nurse-in-charge (NIC). The NIC is responsible for coordinating the nursing work in the zone, facilitating breaks for nursing staff and being a source of support for problem solving. The NICs are more experienced nursing staff, but there is more variability amongst experience and expertise of the individuals in this role compared to the coordinator role. The NIC is not allocated patients, unless there are problems with short staffing. The other nurses in the zones are paired up with healthcare assistants and allocated specific bays and side rooms to look after (by the NIC). The organisation of nursing work means they often remain in these allocated areas, thus reducing opportunities for interaction between nursing staff in the same zone. There is also little interaction between nursing staff in different zones during clinical shifts.

This was an effective location for studying organisational resilience in healthcare because of the fluctuating system demands, the variety of healthcare disciplines working alongside each other and the organisational complexity of the unit. Healthcare staff must constantly adapt the way they work in response to fluctuating system demands. Personal, professional, team, discipline, unit and hospital goals regularly conflict. The researcher worked part-time as staff nurse on this unit for the duration of the thesis. This meant that reflexivity was an important part of the research journey and is discussed later in this chapter (see p 89).

3.4 Research Participants

The research participants were the nursing staff on the AMU. At the beginning of the study there were about 100 nursing staff rostered to work on the unit, which included a range of roles and level of experiences. However, there was high turnover of staff during the study and so during the data collection for phase one there were 77 nursing staff rostered on the unit. Notably many experienced nurses left the unit and many newly qualified nurses started work. According to senior nursing staff, the AMU is a popular destination for newly qualified nurses because of the high patient acuity and opportunity to hone assessment skills. The senior nursing staff also suggested that although a high turnover of staff is normal, with a balance of nurses leaving and joining each year, the turnover of staff on the AMU during the study was unusually high.

There are different roles within the nursing team on the AMU (Table 3-1). In the NHS, staff are paid according to pay bands (Royal College of Nursing, 2017). This is a common way to distinguish between different nursing roles and responsibilities.

Table 3-1 Nursing team roles on the AMU

Job Title	Pay Band	Description of Responsibilities
Nursing assistants	2-3	Unregulated. Normally receive several weeks training. Regular tasks include personal care such as feeding and washing, and limited healthcare interventions, such as assessing skin integrity, removing peripheral cannulas and recording patient's vital signs
Junior Staff Nurses	5	Belong to a professional register. Graduate trained. Regular tasks include assessing, planning, delivering and evaluating healthcare interventions Junior staff nurses worked in a team with nursing assistants and were allocated to care for between five to seven patients per shift.
Senior Staff Nurses	5	Belong to a professional register. Graduate trained. Same roles as junior staff nurses, with additional coordinating responsibilities, such as the NIC role
Junior Sisters/Charge Nurses	6	Belong to a professional register. Graduate trained. Senior coordinating responsibilities, such as NIC or coordinator
Deputy Ward Managers	6	Belong to a professional register. Graduate trained. Senior coordinating responsibilities, such as NIC or coordinator. Significant amount of administrative work necessary for the operation of an inpatient hospital ward, such as staff development and conducting root cause analyses of various negative outcomes.
Ward Managers	7	Belong to a professional register. Graduate trained. Senior coordinating responsibilities, such as NIC or coordinator Significant amount of administrative work necessary for the operation of an inpatient hospital ward, such as staff development and conducting root cause analyses of various negative outcomes. Senior administrative work, such as producing the staff rota every six weeks and managing complaints
Matron	8	Belong to a professional register. Graduate trained. Oversaw several hospital wards (in the same directorate, e.g. acute medicine) Supporting ward managers to fulfil their responsibilities

The matron and ward managers are the gatekeepers for the AMU and were involved throughout the research process, to ensure that data collection strategies were robust and pragmatic, whilst minimising disruption to the clinical work on the unit.

3.5 Research Design

The original RAG questions are technical, abstract and couched in a language that is inaccessible to those who are unfamiliar with the research topic. This is a needless barrier for nursing staff to engage with the principles of resilience engineering. Rather than start with the original RAG questions, the researcher decided to start with the experiences of nursing staff managing their everyday clinical work on the assumption that nurses knew their healthcare system the best and that what they found challenging was likely to be at the heart of the complexity of system performance. The constructivist epistemological lens suggests that understanding resilient system performance in healthcare is about understanding the interaction between the healthcare professionals, patients and the clinical environment. This was the starting point for the research design.

The main research questions are about exploring how the Resilience Analysis Grid could be further developed to provide a replicable process for generating context specific questions for analysing the organisational resilience of a healthcare system and how the views of healthcare staff can be incorporated for doing this. These are exploratory research questions, and this informed an exploratory mixed method research design. Although the later stages of the thesis explore how a resilience engineering theoretical lens can inform quality improvement, the primary research questions are not orientated towards quality improvement, so did not inform the research design.

A mixed method research design informed a three-stage process for generating responding, monitoring, learning and anticipating questions to analyse the organisational resilience of given healthcare system and, support healthcare professionals to reflect on the results and identify potential interventions for improving resilient performance. This was the response to the RAG's implementation gap. The intention

was that this process could be repeated in any healthcare system with any group of healthcare professionals. It was developed and tested with nursing staff on the AMU.

The first stage was facilitating focus groups to explore the challenges of everyday clinical work. It was not practical to talk to all of the nursing staff about all of their work, so in the focus groups there was a representation of the different nursing roles on the AMU. The second stage was generating questions for the four resilience abilities, directly informed by the focus group data, for a cross-sectional survey to capture the views of the wider nursing population about how well the AMU could respond, monitor, learn and anticipate. The third stage was to support nursing staff from the focus groups to reflect on the results of the survey and identify potential system level interventions to improve the AMU's potential for resilience performance.

3.5.1 Mixed Methods

Researchers have used a combination of qualitative and quantitative methods to analyse organisational resilience (Hollnagel, 2010; Mendonça & Wallace, 2015; Jain et al, 2018). However, there is growing consensus that mixed methods are an effective way to study this complex research phenomenon (Mendonça, 2008; Berg et al, 2018). The researcher used a modified explanatory sequential mixed method research design (Creswell & Clark, 2011) (Figure 3-2). A combination of qualitative and quantitative approaches allowed for a greater depth and breadth of understanding than either of these approaches could achieve separately (Creswell, 2013). This aligned well with the resilience engineering theoretical perspective of reaching a deeper, more nuanced understanding of complex sociotechnical system performance. The exploratory sequential mixed method design (Figure 3-2) consisted of two distinct phases; qualitative data collection and analysis, followed by quantitative data collection and analysis (Creswell & Clark, 2011). The quantitative data collection and analysis builds on the results of the first qualitative phase. The researcher modified this research design by adding a third qualitative phase.

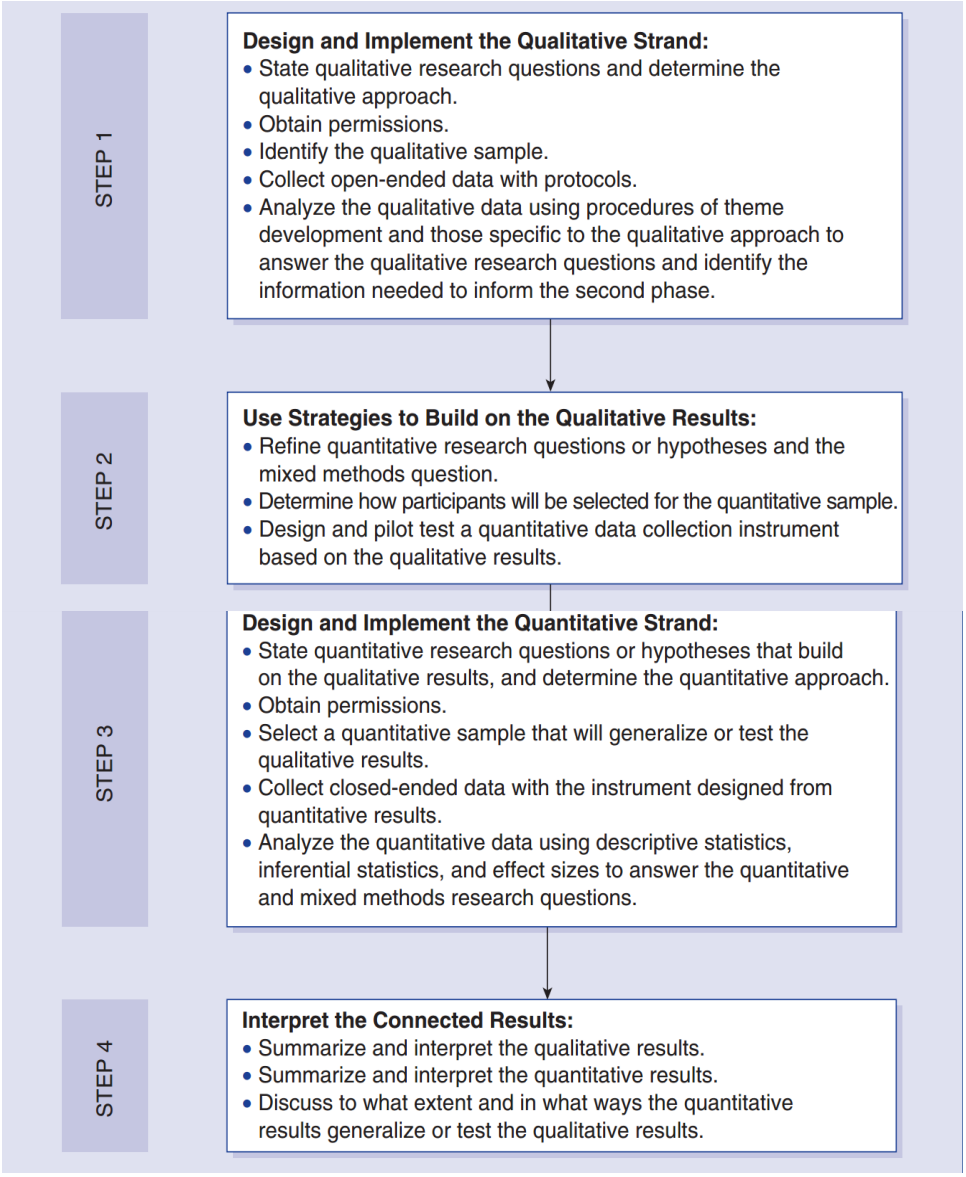

Figure 3-2 Creswell & Clark's (2011) Explanatory Sequential Mixed Method Research Design

This is a well-established research design for testing elements of an emergent theory (Creswell & Clark, 2011) and developing instruments (Creswell, 2013). The researcher used it for exploring the views of a small group of research participants in detail, followed by the collection of quantitative data from a larger number of researcher participants (Creswell et al, 2004). This was followed by a final phase, where the researcher supported participants to reflect on the results of the survey.

3.5.2 Overview of Research Design

There were three distinct phases to the research design (Figure 3-3). Phase one involved the qualitative exploration of the everyday clinical work of nursing staff through focus group discussions. It involved a small group of nurses recruited to represent the different nursing roles on the AMU and known as the expert group. Phase two involved developing responding, monitoring, learning and anticipating items, informed by thematic analysis of focus group data, for a cross-sectional survey. The survey was then administered to all nursing staff on the AMU. This was the quantitative phase of the mixed method study. Phase three involved interviews with members of the expert group (from phase one) to reflect on the survey results and identify potential system level interventions to improve the organisational resilience of the AMU.

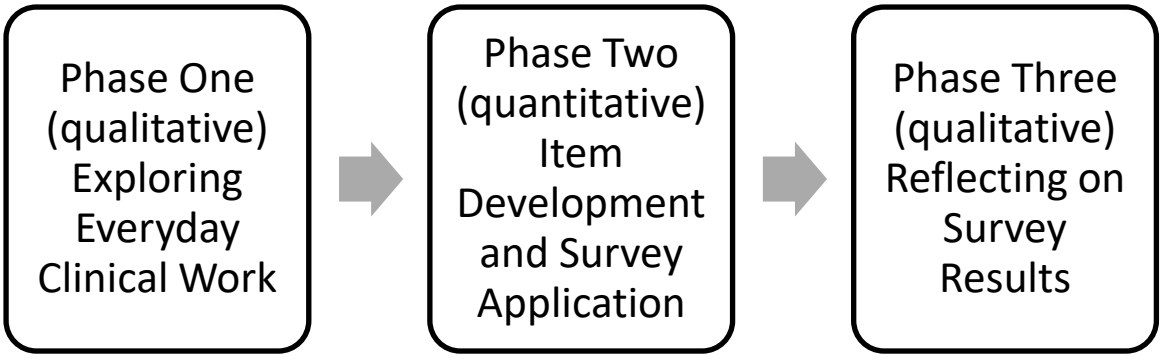

Figure 3-3 Flowchart of Research Design

3.5.3 Phase One – Exploring Everyday Clinical Work

Phase one explores the research question 'What is Work-As-Done for nurses?' and 'How can nurses' Work-As-Done be understood in terms of the four resilience abilities?'. The aim was to elicit accounts of the nurses' everyday clinical work to inform the development of responding, monitoring, learning and anticipating survey items specific to the AMU, in the next phase of the research design (Chapter 5 – Phase Two). The constructivist epistemological lens for understanding organisational resilience suggests exploring Work-As-Done should be about understanding the process by which nursing staff, other healthcare professionals and patients interact with each other and the clinical environment. This was achieved by facilitating focus groups with nursing staff to identify what they found challenging about

their everyday clinical work, why they found it challenging and how they managed these challenges. It was not practical to talk to all nursing staff in sufficient detail about their experiences, so the researcher recruited fourteen participants to take part in a series of focus groups discussing their everyday clinical work in detail. This group of participants were known as the expert group and they had continued involvement in the study in phase two (feeding back about the representativeness of survey items to focus group discussion) and phase three (reflecting on the results of the survey). The researcher transcribed all the focus group data and thematically analysed it using a resilience engineering theoretical lens.

The resilience engineering literature demonstrates there are many ways to explore Work-As-Done, such as ethnographic observations or semi-structured interviews (Hollnagel et al, 2006; Hollnagel et al 2013). In this study, the researcher used focus groups to explore the Work-As-Done in everyday clinical work. The strength of focus groups as a research method is the insight gained from the interaction between participants (Finch et al, 2014). This aligned well with the social constructivist epistemological underpinning of the thesis. Knowledge of organisational resilience comes from understanding the social processes and interactions between healthcare professionals, patients and the clinical environment. Furthermore, the researcher's own clinical experiences suggested that much of the work that nursing staff do to manage the complexity of their everyday clinical work involved internal decision making, such as prioritisation and delegation. Ethnographic observations would be less effective at capturing these internal activities. Finally, the healthcare professionals that work in the system are the experts of this and it is necessary to talk to them about how they manage in their clinical environment. Focus groups were the most effective research method to capture these elements of the research phenomenon.

3.5.4 Phase Two – Item Development and Survey Application

Phase two explored the research question 'How can the development of responding, monitoring, learning and anticipating survey items be informed by accounts of Work-As-Done?'. The aim of phase two was to develop survey items, directly informed by the thematic analysis of focus group data in phase one, for a cross-sectional survey which explored how well the AMU could respond, monitor, learn and anticipate. The intention was to extrapolate the findings from the thematic analysis in phase one, to

explore the wider nursing population's views about the potential for resilient performance on the AMU. The survey was administered to all nursing staff on the AMU. Item development involved a conceptual leap, informed by resilience engineering theory, from accounts of managing the challenging elements of the everyday clinical work to survey items appropriate for a self-administered, cross-sectional survey. The researcher, in conjunction with the Faculty statistician, developed an analysis plan that focused on descriptive statistics and correlation matrices to compare survey results between different sub groups of nursing staff.

3.5.5 Phase Three – Reflecting on Survey Results

Phase three explored the research question 'How can the results of applying the Resilience Analysis Grid inform quality improvement?'. The aim of phase three was to support the expert group to reflect on the results of the survey and identify potential interventions to improve the unit's potential for resilient performance. This phase also involved asking the ward managers of the AMU to identify their safety and quality priorities for the unit. The intention was to compare their priorities with the survey results and expert group reflections to identify whether and in what way the RAG process contributed to safety and quality improvement. An evaluation of this process was not included in the research design. A comprehensive evaluation of this three-stage process would require implementation of the suggested interventions for improvement and this was outside the scope of the study. This sort of evaluation was not appropriate given the early stage of development of the RAG. Instead, to incorporate the users' views of the usefulness of the method and of applying this three-stage process a reflective process was built in to the research design. This fit with the explanatory nature of the study because it supported further exploration of the experience of the project and the usefulness of the results rather than asking direct questions about effectiveness.

3.6 Reflexivity

In this thesis, the researcher viewed reflexivity as an ongoing relationship between the researcher and the research, rather than something that should be recorded to demonstrate competence with a particular methodology. Attia and Edge (2017) suggest reflexivity is a process of on-going mutual

shaping between the researcher and research. They make a distinction between two types of reflexivity. Prospective reflexivity focuses on the effect the whole-person-researcher has on the research and retrospective reflexivity which focuses on the effect of the research on the researcher (Attia & Edge, 2017).

Prospective reflexivity seeks to support the researcher to develop their capacity to understand the significance of the knowledge, feelings, and values they bring to the research and how this shapes the research (Attia & Edge, 2017). They suggest there are four concepts that should inform this type of reflexive practice (Figure 3-4): Trust, Collaboration, Corroboration and Trustworthiness. Insider researchers need to construct a foundation of trust and all their research builds on this. Once this trust has been established, it motivates participants to be more involved with the research process and this collaboration generates more credible data. Engaging effectively with the research participants throughout the research process can motivate participants to provide more alternative sources of data, which can corroborate findings and strengthen the trustworthiness of their accounts (Attia & Edge, 2017).

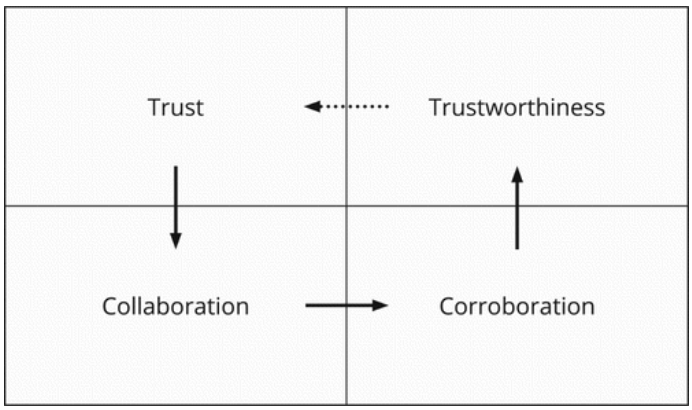

Figure 3-4 Attia & Edge's (2017) conceptual relationship between Trust, Collaboration, Corroboration and Trustworthiness for Prospective Reflexivity

The researcher worked as a nurse on the AMU for the duration of the thesis. They did not start working on the AMU with the intention of becoming an insider in the research setting. However, the researcher's clinical experiences provided useful insights into understanding resilient healthcare theory and how to explore this in practice. As the researcher progressed with the research design, it became clear that conducting the research in the place they worked provided opportunities to reach a deep, nuanced

understanding of the resilient practices of a healthcare system that may not have been possible if they conducted the research elsewhere. Much of resilience engineering theory is couched in technical, abstract language which can be a barrier for healthcare professionals to use this theoretical perspective for understanding and improving the performance of their healthcare systems. The researcher wanted to involve healthcare professionals in the research process because they know their system more intimately than anyone else and therefore have the best understanding of the adaptations necessary for facilitating resilient system performance (Hollnagel et al, 2006; Hollnagel et al, 2013; Wears et al, 2015; Braithwaite et al, 2016).

The researcher had pre-existing professional and social relationships with the nursing team before any recruitment for the study began. As an experienced staff nurse, the researcher was more senior than the newly qualified nurses and healthcare assistants, but less senior than the junior sister/charge nurses and ward managers. The researcher was very aware of the changing dynamics of the relationships between when he was a nurse on the unit and when he was a researcher on the unit. He did not engage with any clinical activities whilst on the unit in a research capacity and did not engage in any research activities whilst on the unit in a clinical capacity. When he was on the unit in nursing uniform, he was a nurse and when he was on the unit in his own clothes he was a researcher. He used this visual signature to support the distinction between roles, and this was useful for both the researcher and his colleagues.

The first challenge for conducting research on the AMU was to establish trust with the gatekeepers (ward manager and matron) and the nursing staff. Establishing trust with the gatekeepers was about involving them in the research design process, so they could raise concerns about the potential for the research to affect the clinical work on the unit and negatively impact the safety of patient care. The researcher did this by emailing them the research design as it developed. This was most important when planning the focus groups in phase one because this had the biggest potential to interrupt clinical work. The researcher wanted to make sure the nursing staff did not feel they were being assessed. The ward management team worked hard to maintain the quality and safety standards on the AMU and this often meant working towards targets, for example supporting patients to complete experience surveys each month or completing incident reports. The researcher did not want to add further concerns for

them, so made it clear he wanted to use a new research perspective to understand and improve safety, rather than assess the managers' ability to run an inpatient hospital ward.

Establishing trust with the remainder of the nursing staff was about reassuring them the researcher was not assessing their individual performance but assessing the way the unit works. The researcher worked hard to explain the resilience engineering theoretical lens was a new way to understand safety, one that recognised nurses' abilities to adapt to various demands as central to maintaining patient safety and getting work done. Once they understood this, most of the nursing staff were willing to engage openly about their experiences managing their everyday clinical work. It provided them with a voice to express their expertise, which current safety and quality practices do not do very well.

Once trust had been established with both the gatekeepers and the nursing staff, it provided a platform for collaborating with the nurses as research participants to explore their clinical environment as experts in their own system. This meant effectively capturing Work-as-Done and exploring the everyday clinical work on the AMU. The next three chapters are devoted to the three phases of the research design. At the end of each of these chapters, there is a reflexivity section where the researcher discusses his experiences pertinent to that part of the research. Then, there is a final retrospective reflexivity section in the discussion chapter, where the researcher focuses on how this research journey affected him.

Chapter 4 – Phase One – Exploring Nursing Staff's Everyday Clinical Work

Phase one explores the research questions 'What is Work-As-Done for nurses?' and 'How can nurses' Work-As-Done be understood in terms of the four resilience abilities?'. The aim was to elicit accounts of the nurses' everyday clinical work to inform the development of responding, monitoring, learning and anticipating survey items specific to the AMU. The constructivist epistemological lens for understanding organisational resilience suggests exploring Work-As-Done should be about understanding the process by which nursing staff, other healthcare professionals and patients interact with each other and the clinical environment. To understand this effectively, it is necessary explore the work from the perspective of the nursing staff because they have the best understanding about what elements of the work are challenging, why it is challenging and how they manage it. This meant engaging nursing staff in discussion to explore their everyday clinical work. There is no guidance about how to do discuss everyday clinical work with nursing staff from a resilience engineering perspective, so the researcher and supervisors needed to create a script to facilitate discussion.

4.1 Design

This was a qualitative study, using focus groups to explore the complexity of nursing staff's everyday clinical work. This was an interpretative approach which explored what it was like for the nurses to work on the AMU. Focus groups were an effective method because they are designed to facilitate interaction between research participants to explore views about the research topic (Finch et al, 2014). This fit well with the constructivist epistemology of the thesis because research participants constructed accounts of their work by interacting with each other. The researcher used Braun and Clarke's (2006) thematic analysis framework to conduct an interpretive thematic analysis of the focus group data, moving beyond the collective experiences discussed in the focus groups to create deeper insights about what was challenging about the nurses' everyday clinical work, why it was challenging and how they managed these challenges.

4.2 Method

4.2.1 Data Collection

There was considerable work around planning the focus groups. The researcher wanted to conduct the focus groups in the hospital, during working hours so that nursing staff did not have to travel anywhere to be involved in the research. To do this effectively, the researcher negotiated the time and location for the focus groups with the gatekeepers of the AMU (matron and ward managers), in order to reach a compromise between access to research participants and maintaining patient safety. The gatekeepers agreed that focus groups could be held in the ward managers' office, on Tuesday to Thursday from 1400 to 1600 because these were normally the quietest times on the unit. Then, there were regular revisions to these preparations to consider the daily, fluctuating pressures on the AMU such as short staffing, sudden influx of patients from the ED and rapidly deteriorating patients. Additionally, the nature of the staff rosters meant there was different sets of nurses on each shift. Consequently, the combination of participants changed for each focus group.

The participants were nursing staff on the AMU. The researcher used purposive sampling to select an expert group, which represented the range of nursing roles and levels of experience on the AMU. The intention was that this expert group would be involved throughout the three phases of the thesis. Recruitment focused on identifying the different roles and levels of experiences across the nursing staff on the AMU. The researcher sent all the AMU nursing staff an email, put up information posters around the unit and provided a verbal reminder into the daily staff briefing (attended by all nursing staff at the beginning of each shift). Most of the expert group were self-selecting by responding to this recruitment drive. However, no nursing assistants came forward to be part of the focus groups. So, the researcher needed to approach several nursing assistants in person and ask them to be part of the expert group. In total, eighteen nurses agreed to be part of the expert group, this included three nursing assistants, ten staff nurses and two junior sisters. This meant there were junior and senior nursing team members, including nurses who were often the NIC and coordinator. The matron and ward managers were not included in the focus groups because the researcher was concerned that some nursing staff may feel unable to talk about the challenging elements of their work if their line managers were present.

The eighteen nurses in the expert group formed a pool of focus group participants. When the local working conditions allowed for a focus group to be conducted on a given day, the researcher checked how many participants from the expert group pool were available. If there were at least five members of the expert group available on that day, then the researcher continued with the focus group. The intention was that each focus group would represent the range of nursing roles and experiences, however this was not always possible. In total, there were nine focus groups. Table 4-1 shows which participants attended each focus group. The researcher and supervisor facilitated the focus groups and they lasted between thirty-five and fifty minutes. The researcher used a digital Dictaphone and their own mobile phone to record the focus groups. Ethical approval was obtained from the university ethics committee (Appendix D, p.217) and interview participants gave written consent to participate in focus group discussions.

Table 4-1 Numbers, Dates and Participants for the Focus Groups in Phase One

No.	Date	Participants
1	24/03/17	Band 5 Staff Nurse, Nursing Assistant
2	24/03/17	Band 5 Staff Nurse, Band 6 Junior Sister
3	25/03/17	Nursing Assistant x 2, Band 6 Charge Nurse, Band 5 (Newly Qualified) Staff Nurse, Band 5 Staff Nurse
4	12/04/17	Band 5 Staff Nurse x 2
5	12/04/17	Band 5 Staff Nurse, Nursing Assistant
6	18/04/17	Band 5 Staff Nurse x 2, Band 6 Junior Sister
7	18/04/17	Band 5 Staff Nurse, Nursing Assistant
8	26/04/17	Band 5 Staff Nurse x 3
9	26/04/17	Band 5 Staff Nurse x 2, Nursing Assistant

There was no consensus in the literature about the number of participants that should be used in a focus group, however there was recognition that a smaller group is more effective for exploring a research subject in more detail (Finch et al, 2014). On most days, it was necessary to have two separate discussions because the clinical demand meant it was not safe for five members of the nursing team to be away from the unit at the same time.

The researcher and supervisor created a topic guide to ensure focus group discussion effectively explored the nurses' everyday clinical work, informed by the four resilience abilities (Table 4-2). There was no guidance in the resilience engineering literature for facilitating discussion of everyday clinical

work or the distinction between Work-as-Imagined and Work-as-Done. The focus group script was informed by discussion with subject experts, the researcher's own clinical experience as a nurse on the AMU, and the original RAG questions.

Table 4-2 Topic Guide for Focus Groups in Phase One

Time	Section	Discussion Points
5 Minutes	Introduction	Introduce everyone present My role as facilitator: - Make sure we discuss as issues as planned - Might ask you a direct question or direct conversation away from a point you are making - Not intending to be rude – making sure everyone has a chance to say something
	Ground Rules	- One person talking at a time - everyone has something valuable to say - Anyone here is free to use information from the discussion, but not to identify who said it
10 Minutes	Topic Introduction	Phase One – expert group (you) representing the range of nursing staff on the Admissions Ward to discuss everyday work I will facilitate discussion to focus on the everyday clinical work on the Admissions Ward
30 Minutes	Question topics	So, I'd like to start by talking about some of the pressures that you face on the Admissions Ward. I think that some of these pressures include things like deteriorating patients, multiple admissions at the same time, short staffing, equipment problems … When was the last time that you faced some of these pressures? Did it go well? 1. Responding - Is there a protocol for responding to this? Is the protocol always helpful? When the protocol is not helpful what do you do? - Is it clear when you need to start the protocol? Do you ever delay your response? Do you ever start early? - How long does this work for? - Are there similar events that do not have a prepared response? - Who makes sure the protocol is started? Does anyone else know when this is done? 2. Monitoring - How do you know when pressures are increasing? What do you look at? How regularly do you look at it? - Do these indicators let you know in advance or by the time they are happening its tool late? (e.g. No-one has had a morning break) - Does looking at this always help? (Tell me about a time that it helped … Tell me about a time that it did not help …) - Who else is doing this? Who else do you talk to about this? - Do you use anything other than your 'gut' feeling? 3. Anticipating - Do you think about what your work load/zone work load/ward work load is going to be like during the day? Later in the afternoon? For the night shift? During the week? - Who thinks about this? Who do you talk to about this? - What do you look at? Are there some pressures that you know will be ongoing? How do you know?

		4. Learning - What sort of things happen on the ward to facilitate learning? Is this helpful for you? Can you remember a time that learning from something was useful? - Who do you talk to about your learning? - Do you learn from things that go well in addition to things that did not go well? - After an event when does the learning happen? - Who decides what you learn from? - Where does learning happen?
5 minutes	Closing	I'm going to be doing a similar session with the other members of the expert group Then I will send you information about the next focus group Eventually I will develop questions based on these discussion points and then test these questions with you Has anyone got any questions? If you have any thoughts or questions please email me Thank you very much for your time

The first two focus groups were dedicated to identifying what nursing staff found challenging about their everyday clinical work. This discussion generated a list of different challenges:

1. Mismatch between ED handover and patient condition on arrival to the AMU
2. Deteriorating patients
3. Skill mix of the nursing team – Newly qualified nurses, medication administration competencies
4. Multiple simultaneous admissions from the ED
5. Staffing – shortages, sickness, use of temporary nursing staff (bank or agency staff)
6. Poor teamwork
7. Equipment problems or shortages
8. Patient flow pressure – admissions, transfers, discharges
9. Challenging patients – aggressive behaviour, confusion, mental health
10. Time management
11. Prioritising
12. Complex patients – demand for specific competencies

Subsequent focus groups were offered the opportunity to add to this list, however after the first two focus groups there were no additional challenges. The subsequent seven focus groups focused on

exploring these challenges in more depth. The intention was to explore why nursing staff found these aspects of their work challenging and how they managed these challenges.

4.2.2 Data Analysis

The researcher conducted a theoretically informed thematic analysis of the focus group transcripts. This was a combined deductive, inductive approach for analysing the focus group data. The CARe Resilience Model (Figure 4-1) provided the theoretical lens for the initial deductive analysis. This provided some structure for understanding how the focus group data related to high-level resilience concepts, such as adaptations focused on realigning demand and capacity. However, to understand the focus group data in more detail, the researcher used an inductive analysis, informed by the four resilience abilities, because this was more effective at understanding specific activities nurses used to adapt to the variability of system demands and manage the complexity of their everyday clinical work. This allowed for a more comprehensive analysis of the focus group data than a simple descriptive analysis could provide.

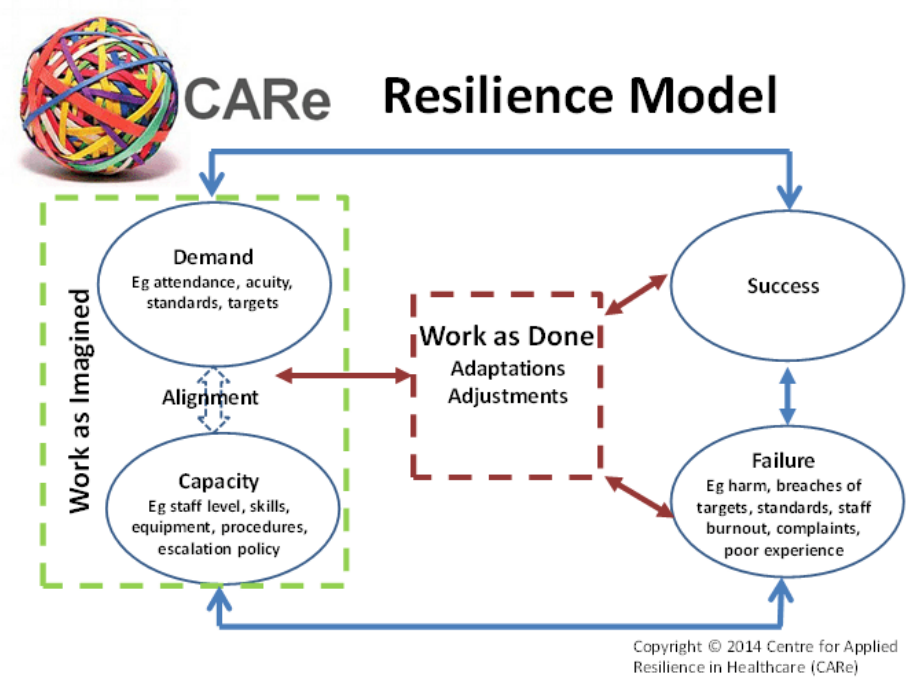

Figure 4-1 CARe Resilience Model

The analysis was informed by Braun and Clarke's (2006) framework for thematic analysis. The analysis started with data transcription and the researcher transcribed all the focus group audio data using

Tracy's (2012) transcription guidelines (Appendix C p.216). The researcher took notes during transcription to document any ideas about themes or relationships between participant's comments. Then, the researcher read all the transcripts together and made further notes about any overarching themes. Following this, the researcher read each transcript in more detail and line-by-line, generated initial codes using NVIVO software programme. Codes that shared similar meanings were collated into themes and sub themes. Each theme was then examined to see how it related to the transcripts as a whole. The researcher created a map of themes to visualise the relationships between themes and sub themes (Figure 4-2). Finally, the names of the themes were edited so that they most effectively represented their meaning.

4.3 Findings

This section presents the findings from the thematic analysis of the focus group data. The findings show that the nursing staff's everyday clinical work is incredibly complex. The social element of working in a healthcare system involved continuous informal trade-offs and negotiations with other nurses, healthcare professionals and even patients. There is a clear link between the effectiveness of individuals and team performance and the effectiveness of system performance. There are five main themes: *Demand*, *Capacity, Clinical Expertise, Learning From Each Other* and *Being a Nurse on the AMU*. Figure 4-2 shows a map of these themes.

In the focus group transcripts, F1 and F2 were the facilitators (researcher and supervisor). P1, P2, P3, Px were the participants. Table 4-1 (p.95) shows which participants were in each focus group.

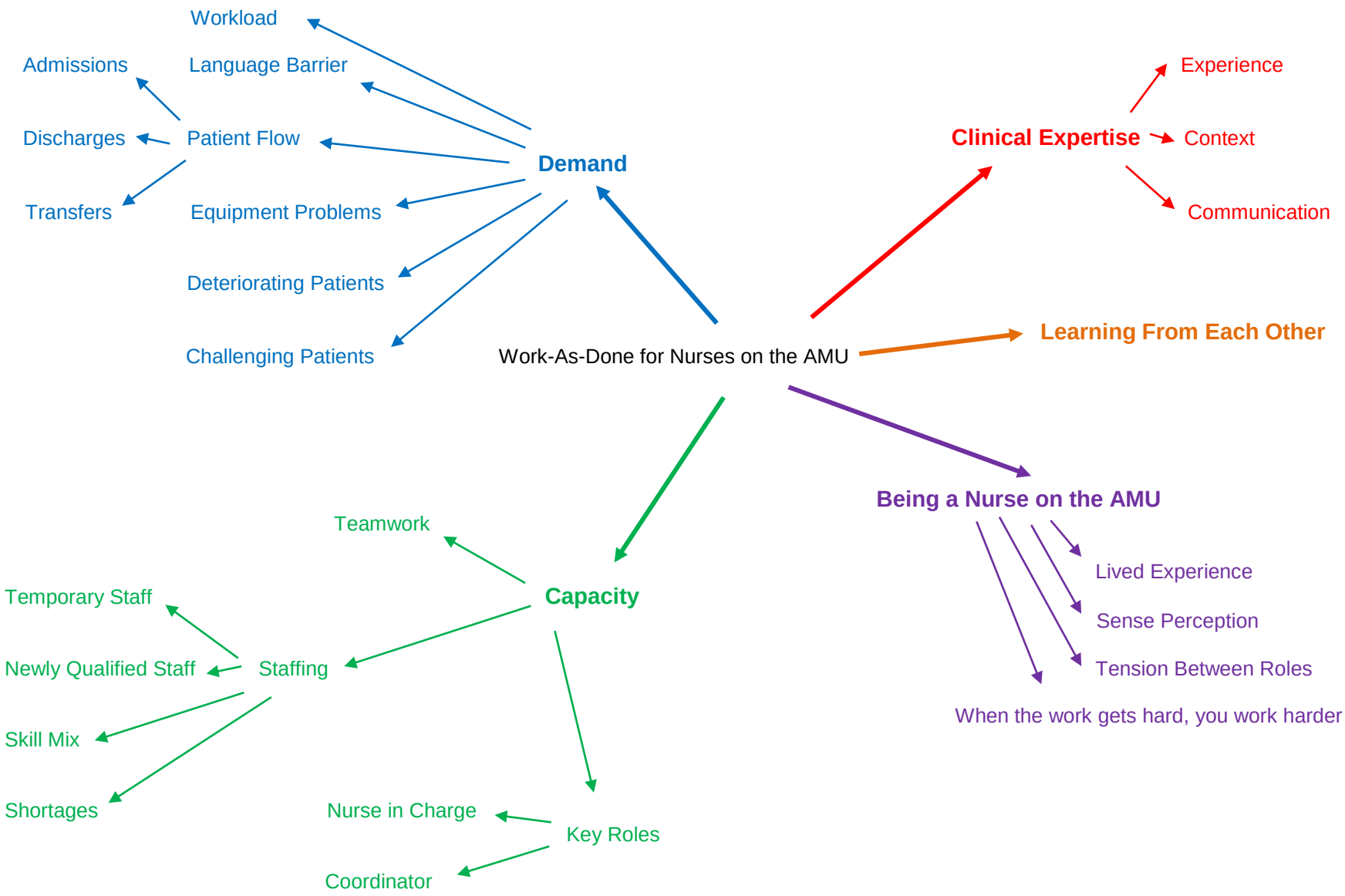

Figure 4-2 Map of Themes from Thematic Analysis of Focus Group Data in Phase One

4.3.1 Demand

The *Demand* theme represents the challenges that nursing staff must respond to during their everyday clinical work. Table 4-3 shows the six sub themes that represent the range of challenges nurses had to respond to. The complexity of their everyday clinical work is driven by having to manage these challenges simultaneously at individual, team and system levels.

Table 4-3 Sub-themes associated with the Demand theme

Sub Theme	Description
Deteriorating Patients	Supporting clinically unstable patients
Challenging Patients	Supporting patients with challenging behaviour, e.g. aggression, confusion, psychosis
Equipment Problems	Malfunctioning or absent equipment that is required for patient care
Language Barrier	Caring for patients who do not speak English
Admissions	Managing the flow of patients being admitted to the AMU from the ED, GP referral or outpatient clinic
Transfers	Managing the flow of patients being transferred to other inpatient hospital wards
Discharges	Managing the flow of patients being discharged home (or equivalent setting)
Workload	Managing the volume, frequency and urgency of tasks that nursing staff need to complete

Supporting clinically unstable patients is one of the most significant challenges for nursing staff and this is represented by the *Deteriorating Patients* sub theme. Most of the work is about escalating deteriorating patients (to ensure timely assessment by appropriate healthcare professionals or teams). There was a clear consensus that escalation protocols could not account for the range of complexities for managing deteriorating patients. Each of the nurses were aware of the distinction between what they should do (Work-As-Imagined) and what they actually do (Work-As-Done) when escalating deteriorating patients. They could consistently present a rationale to justify adjustments to the way they used escalation protocols.

> P1: So you're obviously going to do more routine obs because they're needing a closer eye on. But if they're scoring. (2) You'd always escalate if they're different because you don't know what's going on.
> P1: Three in one parameter or five. Overall.
> F1: And if it's five you always escalate?
> P1: Meant to.
> P1: Yer. (3). I'd still escalate if they're a five. But not always to CRT. Sometimes you get them on the phone. And they're like the plans good. The plans good so we don't need to do anything. Sometimes it's because you've had previous experience with the same situation.
> (Focus Group One)

The discussion of different scores and parameters relates to the National Early Warning Score (NEWS), which is central to the escalation protocol. The NEWS is a standardised track and trigger tool, which assigns numerical values and subsequent actions to physiological observations e.g. heart rate, temperature etc. (McGinley & Pearse, 2012). The higher the NEWS the more unwell the patient, for example a NEWS of seven or more mandates emergency assessment by a clinical team with critical care competencies (McGinley & Pearse, 2012). The Critical Response Team (CRT) are the clinical team with the critical care competencies at this hospital. In the above extract, the nurse is aware of what they were '*meant to do'* in response to a combined NEWS of five or three in one parameter. However, they adapted their response to the NEWS according to the clinical needs of the patient. They described a range of adaptations, such as escalating a patient earlier than the protocol stated because of previous experiences. These adaptations also include choosing not to escalate when they should, such as when a patient has a high NEWS due to walking to the toilet and back. The nurse in the above extract knew that if they repeated the observations in ten minutes the NEWS would be lower, and escalation would not be required. There was general agreement amongst the nurses that clinical expertise was necessary for understanding how to adapt the way they use the escalation protocol to effectively maintain patients' safety. This demonstrated the escalation protocol could not account for all the different ways patients can deteriorate.

There is an extensive social element to managing the complexity of the conversations around escalating deteriorating patients. It affected individual, team and system level responses.

> 'F2: So. Does anybody ever say to you? Why did you call me? It was only a two.
> P1: I do start the conversation. With I know it's only a two. BUT.
> (LAUGHTER [00:29:14])
> P1: I don't want my ear chewed off. Mm. Yer. I do start off. By saying. I know. He's this. This. And this. BUT. Like.
> P2: Hear me out.
> LAUGHTER [00:29:25]
> P1: But his bloods said this. And his chest x-ray said that. Or whatever. And I can see that he might not be this stable. Or seemingly stable. For long. You know. I can see it kind of. Going down this pathway.
> F1: And do you always get the response that yo:u. are looking for when you do that?
> P1: Um.
> P2: It depends on how you approach it. '
> (Focus Group Three)

In this instance, the nurse attempted to escalate the deteriorating patient to CRT, however, their concerns are not supported by a NEWS of two. The nurse knows this and understands the need to gather alternative sources of information such as '*his bloods* [test] *said this'*, and '*his chest x-ray said*

that'. They also know they need to change the language they use to increase the chances of effectively communicating their concern. They use phrases such as *'I know. He's this … BUT'* to signpost awareness their clinical concern is not supported by the NEWS, nonetheless they are still concerned about the patient's condition. The phrase '*I don't want my ear chewed off*' suggests this nurse has had previous negative experiences of escalating a deteriorating patient earlier than the escalation protocol suggests. There was widespread agreement that the variability in the effectiveness of their early escalation attempts related to the interaction with other healthcare professionals (or patients). The success of their escalation relies on the person(s) in the conversation responding appropriately to their social cues. This frequently involves a negotiation between the nurse and another healthcare professional to balance the various system demands and collectively identify the best course of action for everyone involved. The interaction with other healthcare professionals (including other nurses) is not limited to escalating deteriorating patients and affects all other dimensions of the nurses' everyday clinical work.

Alongside deteriorating patients, another frequent demand is patients with challenging behaviour and this includes aggression, confusion, delirium and a range of behaviours from patients with mental health problems. This is represented in the *Challenging Patients* sub theme. Nursing staff report that challenging behaviour prevents them from implementing healthcare interventions, for example a patient refusing to take medication. Identifying effective solutions to these challenges involves making decisions informed by a combination of individual and team expertise, guidelines and protocols, and the particular context of that episode of patient care.

> P2: Because. Sometimes. You do see it getting escalated late. And that's when it already started with things to get out of control. And crumble.
> P1: And you can use the side rooms as well.
> P2: Yer.
> P1: They can be pretty handy as well. I know that sounds terrible. But if there is a deteriorating patient. Next to a violent patient. You can't really have things going on in one bay.
> (Focus Group Four)

In this instance, a patient's violent behaviour prevents the nursing staff from effectively caring for a clinically unstable patient in the next bed and the violent patient is moved into a side room. Moving challenging patients into side rooms reduces the impact of their aggressive behaviour on other patients and staff. This decision is made because there was a side room available, however side rooms are not always available, and this forces the nurses to seek other solutions, such as moving the patients that

are not being challenging or changing the organisation of nursing work to alter how the team manage the patient caseload. Whilst there was general agreement amongst the nurses that the most effective actions for managing challenging patients changed according to particular scenarios, it was only the senior nurses who could articulate a range of responses to different scenarios. This demonstrates identifying effective solutions for the challenging elements of everyday clinical work is a highly nuanced, complex activity.

The fluctuating quantity, frequency and priority of tasks is difficult for nursing staff to manage. They agreed there is a significant amount of cognitive work keeping track of a constantly evolving list of tasks. This is represented in the *Workload* sub theme. Several of the junior nurses reported that a common challenge is the difference between the status of the patient according to the telephone handover from the Emergency Department (ED) and the status of the patient when they arrive on the AMU. This is a challenge because it forces the nurses on the AMU to change the way they prioritise the tasks in their workload.

> P1: So. We got a handover. He was newsing a four. And then. When he actually came to me. He was newsing about a TWELVE. And his VBG [blood test] was completely dreadful. There was just a few. Little gaps and it was. At a really really bad time. When we had. Like. I think. I think it was part of the winter pressures.
> F1: Mm.
> P1: Time. I think. I don't know. I remember that really screwed me. And he was really really sick. Erm. He ended up going to intensive care afterwards. So. This patient that. You know. Obviously. His bloods I can't remember exactly what they said about that. But. Erm. I remember I just had. This one view of how this patient might come to me. And then he came to me. I was like. That was definitely NOT his early warning score. Like. Before.
> (Focus Group Four)

The sickest patient is always their highest priority. In this extract, the nurse needs to manage their sickest patient, whilst simultaneously re-prioritising all their other tasks. They often expressed frustration at external pressures affecting the way they prioritise their workload, for example new patients arriving from ED or the need to transfer a patient to another ward. This challenge was more pertinent to the junior nursing staff because they were more regularly involved with direct patient care, whereas the senior nurses were more involved with patient flow.

The challenges directly associated with patient flow drew attention to the tension between system level priorities and patient care priorities. The sub theme *Transfers* is about the challenges associated with transferring patients from the AMU to another inpatient hospital setting.

P1: And then. You kind of. (3). Yer. So they're pushing you. But. You think. Well. There's always stuff I need to sort out for this patient before I can go home.
P2: Hm.
P1: So:. I don't think. (2). Then. They. They. Said. Downward pressure. They're getting from the. From the. SNPs. And the bed manager. And A and E. And we're getting it form them. So. I think. You know. (2). Yer. That's. That's one of the problems that I find. I think.
(Focus Group One)

All the nursing staff talk about *'Downward pressure'* in a negative way, although this pressure manifests in different ways for junior and senior nurses. They view it as an external pressure on their decision making, forcing them into prioritising work associated with patient flow over direct patient care. For the junior nurses, this pressure forced them to leave non-essential tasks, such as dressing changes or therapeutic conversations with patients, and prioritise transferring a patient to another ward. They felt uncomfortable leaving these tasks incomplete, despite understanding the wider system pressures of the hospital. For the senior nurses, this pressure involved interacting more regularly with senior healthcare professionals, such as the site nurse practitioners, who wanted frequent updates about the status of the patient flow through AMU. The extent that these external factors affects nurses' decision making varied daily. The most prominent external demand to their decision making is increased pressure to move patients out of the ED.

Another example of the tension between system level priorities and patient care priorities is discharging patients home. Discharges are complex tasks which require high levels of coordination between several different healthcare disciplines, such as doctors, pharmacists and social services. The sub theme *Discharges* represents the challenges associated with discharging patients home from the unit. This challenging because nurses are often responsible for facilitating multiple members of the MDT to complete tasks to ensure the timely discharge of patients.

F1: (LAUGHS). Um. And that. And you were having to phone multiple different?
P1: Yer! As I said. I started with the discharge coordinator. Who said that. We can't help. Because it's a CCG. So like. Fine. And I phoned the council. And they couldn't help. Because it was the weekend. And then I phoned the. Back to the discharge coordinator. And then. Talking to the coordinator here. (2). AND the doctors. And everybody else. And. There was like. No way. This woman was going anywhere. Until. Cos. The one thing was. Make sure. That. The. Carers were in place. Before you send them home.
(Focus Group Eight)

In this extract the nurse talks about a situation where they had four different conversations about restarting a patient's package of care to discharge them home. There was consistent agreement amongst the nurses that the most regular challenge for discharging patients home was ensuring there is sufficient social support systems in place. This often involves multiple conversations with multiple

healthcare disciplines before this could be established. The senior nurses were more aware than the junior nurses of the impetus for completing these discharging tasks earlier in the day so that social support systems are in place when a patient is discharged later in the day. This often led to tension between tasks associated with clinical priorities (need to be completed now to support patients now) and tasks associated with discharges (need to be completed now to support patients later). This tension is present at individual, team and system levels.

Since this was a central London hospital, there was a wide range of different patient nationalities. This meant there are often patients that spoke English as a second language, or even spoke no English at all. The sub theme *Language Barrier* represents the challenges associated with supporting patients that did not speak English. There are a range of adaptations they used to manage this challenge.

> P1: Er. Yer. A lot of the time. It is. (2). Finding. A. Member. Of. Staff. Because we have quite a multi-cultural team. Um. So. Quite often. You can find somebody. Um. We do have language line. Obviously. But. I think. Everyone is very aware of how much it costs.
> F1: It's pretty expensive isn't it
> P1: Yer! (LAUGHS)
> P2: How much is it?
> P1: £500 just to call. Like.
> P2: Mm. I should be in that job.
> P1: Like even if. You don't even speak to anyone for very long.
> (Focus Group Seven)

There was consistent agreement that the '*multi-cultural team'* of healthcare professionals on the AMU is the most frequent source of support for translation. The system level response is to use a telephone interpretation service. However, the nurses view this negatively because of the cost (both financial and time costs) associated with using it. They prefer to use informal translation services, such as family or healthcare team members, because they found this to be quicker and more effective. These adaptations are mainly focused on the healthcare professionals based on the AMU, but in some exceptional circumstance it also involves calling the ED when a particular nurse known to speak a particular language is working to ask if they could come to the AMU to translate.

Sometimes the medical equipment required for specific healthcare interventions is the source of challenges to delivering patient care and this is represented by the *Equipment Problems* sub theme. The most common challenges associated with equipment are missing or faulty equipment. Nursing staff use a range of medical equipment for diagnostic and treatment purposes. All the nurses agreed that equipment is not usually available at the point of needing it.

P1: (2) I think we had one dynamap at one point.
(Focus Group One)

A '*dynamap'* is an electric sphygmomanometer, used for measuring blood pressure. In this discussion, nursing staff report that there is a high demand for these machines in the morning. Nursing staff tend to use them at a similar time across the unit and this can result in several people wanting to use the dynamap at the same time. The adaptations to missing or faulty equipment involve negotiating with other nurses, finding equipment from another location or changing the order of tasks.

4.3.2 Capacity

The *Capacity* theme encapsulates the system elements that are in place to support nursing staff to meet the challenges of their everyday clinical work. There are seven sub themes and they are displayed in Table 4-4. Although many elements of the capacity theme are the system's response to the range of demands, these are often the source of further challenges. For example, the staffing levels of nurses on the AMU is organised to provide enough nursing staff to meet patients' needs. However, staffing is not straightforward and can be the source of further challenges.

Table 4-4 Sub themes associated with Capacity theme

Sub theme	Description
Teamwork	Nursing staff working together to meet the demands of everyday clinical work
Temporary Staffing	The challenges working with agency or bank staff
Newly Qualified Staff	The challenges working with staff members that have recently qualified
Skill Mix	The range of abilities possessed by a nursing team
Staff Shortages	The challenges associated with being short staffed
Nurse in Charge	A key role for facilitating successful performance of the nursing team in a zone
Coordinator	A key role for facilitating successful performance of the ward

The complexity of the work on the AMU means that nursing staff need to work together in multidisciplinary healthcare teams to keep patients safe. The sub theme *Teamwork* represents how nursing staff work together with each other and other healthcare disciplines to meet the demands of everyday clinical work. Teamwork is frequently mentioned as a source of support for challenging work.

F1: Yer. And I guess. Are there. Is there anything that you find helpful to respond. Um. Manage that? So that you don't get left behind?
P1: Maybe you try and ask the nurse in charge to try and do a couple of meds. While you try and get on top of a sick patient. Or ask the students or HCAs if they could start the obs and washes while I try and get everything else sorted. (2). Try and get the team work going.
(Focus Group One)

There was universal agreement amongst the nursing staff that they frequently have too many tasks to complete at the same time and describe good teamwork as a source of support with these tasks. This often took the form of supporting a colleague who has more tasks to do than other team members.

The nurses agreed that good teamwork is viewed as a source of support, but poor teamwork is viewed as a challenge.

> P1: Another. Example of bad team work is. You have somebody who. (2) Um. A nursing assistant. Um an assistant. Who just doesn't want to do anything the whole day.
> P2: And just will not help you. Well. Will not. Help with the care of the patients. And just sits on a computer and disappears for three hours. Whereas. If you work as a team. You get in. Get everything done. And. The nursing assistants even. Good team work is. I've got three. They talk to each other. I've got three double washes. In my team. And they've got none. So. Good team work would be going and helping them. Bad team work would be'-
> (Focus Group Two)

The junior nurses thought that poor teamwork is about people not doing their share of the work, whereas the senior nurses thought poor teamwork is about people not providing help to others when they have less to do. Poor teamwork is associated with a greater personal workload because these tasks are not shared across the team.

Staffing is a complex issue. Overall, staffing is viewed as a positive source of support. There was universal agreement that having the right number of nurses with the right skills is necessary to effectively manage the challenges of everyday clinical work. However, getting this right is not straightforward. Nursing staff use a range of adaptations so that patient care is not compromised by staffing problems. The sub themes *Temporary Staffing, Newly Qualified Staff, Staff Shortages* and *Skill Mix* all relate to how nurses manage this.

Short staffing is one of the most common staffing challenges. Normally, it is the result of staff illnesses or insufficient numbers of regular nursing staff available to work on the rota. The sub theme *Staff Shortages* represents the challenges associated with an inadequate number of nursing staff on a shift. This changes the way nurses manage the complexities of their everyday clinical work.

> P1: Or you might not have enough staff. So. You might need to jump to the wanderguard. Sooner rather than later.
> P2: Mm. Yer.
> P1: Just to make sure. You can get on with. The other stuff.
> F1: Oh. Ok. So. You're staffing would affect what interventions you would use.
> P1: Mm.
> P2: Absolutely.

> P1: You would try and bring in a nursing. In the zone. To try and help. But they might be needed to do obs and washes. You can't do that. With the curtains open. To keep an eye on this person. So you might. Put the wanderguard on. Until you can put. Someone back in the bay.
> (Focus Group Six)

A '*wanderguard'* is a falls prevention monitor, it alarms when a patient attempts to stand up unaided. This piece of medical equipment is commonly used to maintain the safety of patients who are at high risk of falling, particularly if they are confused or delirious. Short staffing affects how nursing staff use this piece of equipment. Many nurses report they consider using this piece of equipment much sooner when they are short staffed because it allows for a greater level of monitoring with fewer members of nursing staff. This is an example of how nurses change their practice in response to short staffing.

Effective staffing is about more than just the number of nurses, it also concerns how experienced each member of the team is and what skills or competencies they are proficient in. The sub theme *Skill mix* is about the challenges associated with an insufficient mix of skills across the individuals in a team.

> P1: Oh I've got another one. I think it's about training and things? So. You need to go through doing special training for trache care. For high flow oxygen. Um. Blood transfusions. (1). I don't know if that would link into skill mix though?
> …
> P1: As well as. Like. Having patients that need all those things on the ward and there is only certain nurses that can do that-
> F2: So. Do you mean that you have these complex patients and there is often not the staff that are. Credited. Or-
> P1: [Yer. Or maybe they've not passed their competencies. Or skills. So they can't-
> F2: Oh-
> P1: [administer or-
> (Focus Group One)

Some clinical skills require specific training, for example male catheterisation. Only the senior nurses tend to be competent in this skill, so when a junior nurse has a male patient that requires a catheter and they are not trained in this skill, they need to find a senior nurse to complete this task for them. It is important to ensure there is an appropriate skill mix across a nursing team, so they can effectively meet the variable demands of their everyday clinical work. The difficulty of managing nursing staff levels on the AMU reinforces the finding that the nurses' everyday clinical work on the AMU is extraordinarily complex. Ward managers could not only focus on the numbers of nurses (although system pressures to show appropriate staffing levels does) and frequently have to balance experienced and inexperienced staff to ensure an appropriate skill mix is available on each shift. This often involves phoning nurses on their days off to change the rota in response to nurses reporting illness for an upcoming shift.

When there are not enough regular nursing staff available the ward managers book temporary nursing staff to work on the AMU. There are two kinds of temporary staff, agency staff and bank staff. Agency staff are nurses or nursing assistants that are employed by a private agency and hired to work when there are not enough regular members of staff available. Bank staff are nurses and nursing assistants who work in the same hospital but normally work in another setting and choose to do an extra shift on their days off. The sub theme *Temporary Staffing* represents the challenges of working with agency or bank staff. The use of temporary staffing is a common solution to short staffing. However, this is not a straight forward solution to shortages. Agency and bank staff are often unfamiliar with the local adaptations and are therefore much less effective at adapting to the challenges of everyday clinical work. They normally require more support than regular members of staff.

> F1: And they create more work?
> P3: They create more work. So. It's just easier for us. To take the work load on. (2). I know it doesn't seem nice that way. But by the time you've got to do drugs. And. An agency's drugs. Because they can't do it. And then. Every time. There are obs that need doing. They ask to help getting on to enoting. To look at plans. And then also EPR. And printing stickers. And labels. (3). You kind of take on two workloads at once.
> …
> P3: It's kind of. Easier. To get rid of them. Then. (3). Kind of. Evenly.
> F1: Kind of. Reallocated. Your-
> P3: [Yer. Your permanent. Staff.
> (Focus Group Three)

Agency nurses and nursing assistants vary in their effectiveness. Nurses report that some agency nurses create more challenges than short staffing and that it is easier to manage short staffing than temporary staffing. Effective staffing is not just about making up short falls in regular staff numbers with temporary staff because this often created more work for the regular staff. Almost all the nurses report that they would rather be short staffed than work with ineffective temporary nurses or nursing assistants. The ward managers could not control who arrives when they request a bank or agency nurse. However, they use informal strategies such as negotiating more hours with temporary staff (when they are on the AMU) who are viewed as effective to gain some control over this process. The senior nurses talked about examples of temporary staff that were asked to go home half way through a shift because they were ineffective in their role.

A further complexity to the staffing challenges of the AMU are newly qualified nurses. Just as temporary staff are not as effective as regular staff, newly qualified nurses are not as effective as regular staff. However, the nursing team need to support the newly qualified nurses to develop and become as

effective as regular staff. This presents a different challenge than temporary staffing and is represented by the *Newly Qualified Staff* sub theme.

> P4: I'm there today! And. Yer. Like. I have no idea. Is it (Referring to another nurse)? I'm working with (Referring to another nurse). And I've got no idea what is going in her bay. You know.
> F2: Is it important that you do?
> P4: I'd say so. Just because. Our nurse in charge (Referring to another nurse). She's so thinly spread. Amongst all three bays. Amongst all the patients. That if she. If I can't find her. I'm a bit like. Oh. Where's (Referring to another nurse)! But she might be with (Referring to another nurse). Who has three sick patients? And I just. Don't know about them. Um. So. I think. In terms of going up to the nurse in charge as well.
> (Focus Group Three)

The newly qualified nurses in the focus groups reported they felt less effective in their role because they have less clinical experience, take longer to complete tasks and lack local system knowledge. They are also less aware of the adaptations used by nursing staff. The more experienced nurses talked about the balance between supporting newly qualified nurses to complete tasks, so they become more proficient in them and getting the work done themselves to ensure clinical tasks are completed quickly enough.

There are individual roles that are key to the effective performance of the team and the system. The sub theme *Nurse in Charge* represents the work the nurse in charge (NIC) does to enable the successful performance of the nursing team. The NIC is frequently mentioned as a source of support for the rest of nursing team.

> P2: I mean. More often than not. If people are. (2). Erm. Have a higher news score. Then people are generally. Quite on top of managing them. Themselves.
> F1: Mm.
> P2: It's just. If. I'm nurse in charge. I would like to know that. Especially for the purposes of handing over. As well.
> F1: Yep. And have that awareness of the workload of the zone.
> P2: Yer. So that I know where. Extra help is needed. Or. You know. If that bay is quiet settled. Or quiet even. And you can say. Oh. Would you mind giving. So and so a hand. You know. See if they are ok? They've got a sick patient.
> F1: Mm.
> P2: It's about using the resources that you've got.
> (Focus Group Four)

The NIC is expected to understand the nursing team's workload and identify how to coordinate the team most effectively. There are a range of activities associated with the NIC role. Many of the junior nurses report that an effective NIC helps them with clinical tasks when they feel overwhelmed and is a source of advice for decision making. There was overall agreement that there is a lot of variability between how NICs manage these tasks and consequently how effective different individuals NICs are in their role.

In addition to the NIC, there is the coordinator, who is responsible for patient flow through the AMU and is normally the most experienced nurse on the unit that day. The sub theme *Coordinator* represents the challenges reported by coordinators to enable the successful performance of the unit. They are a senior source of expertise to the nursing staff on the AMU.

> P1: I was just going to add that. Usually. The coordinators are really good in that scenario. They tend not to allocate. You know. An additional sicky. To that zone. Because they know that zone is under pressure already.
> P2: Uh uh.
> P1: And they might try to empty your bay as well. So if there is the potential for discharges home. You know. They would. You know. Try to tighten up on discharges. They'll try to transfer people. That's what happened. One time. I think. With me. And they did try to. Like. Not allocate to me. When I had someone quite challenging.
> P2: Yer. I definitely had that experience.
> P1: They're just this invisible support. Just comes from nowhere. It's great.
> P2: You probably wouldn't even notice that at the time. Its' only later. That you would notice that.
> (Focus Group Four)

One of the main roles of the coordinator is to facilitate patient flow through the unit. This involves directing patient admissions from the ED. To do this effectively they need an understanding of the workload of nursing teams in each part of the unit. This is a highly nuanced and complex role that requires a detailed understanding of how challenges are managed by the nursing team. This role is only undertaken by the most experienced nursing staff because only they have sufficient clinical knowledge, local system experience and decision-making skills to do this effectively. Despite the relative significance of the NIC and coordinator roles for the unit, there was still agreement that there is a lot of variability between how individuals work in these roles.

4.3.3 Clinical Expertise

The *Clinical Expertise* theme represents the individual knowledge and experience that the nurses draw upon to manage the complexity of their everyday clinical work. Alongside the system demands and the system capacity, there was a set of individual knowledge and skills nurses used to manage the complexity of their everyday clinical work. This was part of their Work-As-Done. This theme represents how nurses chose to respond to the challenges in their everyday clinical work. There are three sub themes associated with this theme and they are displayed in Table 4-5.

Table 4-5 Sub themes associated with Clinical Expertise theme

Sub theme	Description
Experience	The range of previous experiences that inform decisions
Context	The particular context that affected decision making
Communication	An individual's ability to exchange information effectively

The *Experience* sub theme represents the range of previous experiences the nurses use to inform their decision making. This is central for identifying which adaptations work in which circumstances. The more experience an individual has, the greater the range of adaptations they could use. This provides some insight into why newly qualified nurses are less effective in their role and why the most experienced nurses are a source of support for others.

> P2: Yer. Try and sell it to them [the medical team]. (LAUGHS). Does that sound really bad?
> F1: No. No.
> P1: I think usually they [the medical team] respond quite well.
> P2: Yer.
> P1: Because I have had a case where I have escalated seemingly well people. But said it. In a way. So that they have the potential to be less stable then they are now. And they can see that as well. And accept that we might have that foresight. Like. Just because we've seen so many of the same things. Happen. Over and over.
> (Focus Group Four)

In this extract, P1 and P2 are explaining why they escalate some patients with certain medical conditions earlier than the escalation protocol suggests. They describe previous experiences looking after similar patients where they did not escalate a similar patient early enough and they rapidly deteriorated. Repeated exposure to the same clinical scenarios allows this nurse to have '*foresight'* about the risks associated with certain medical conditions. These experiences allow nursing staff to develop an internal catalogue of adaptations that are effective in certain scenarios. However, this nurse also reported that these adaptations don't always have the same outcome. For example, escalating a patient to the medical team before the escalation protocol suggests does not always result in the medical team reviewing the patient.

Clinical experience was not enough to explain how the nurses chose to implement the range of adaptations at their disposal. Alongside the internal catalogue of previous experiences, the specific context surrounding each clinical scenario affected how the nurses adapted to various demands. Each adaptation is informed by the particular set of circumstances surrounding it. The sub theme *Context* represents this. Clinical expertise and local system knowledge are not entirely sufficient for effective adaptations, the nurses suggest that adaptations need to be informed by the circumstances surrounding the scenario in front of them.

F1: So. Rather than the workload of the nurse. You look at the experience of the nurse.
P1: Well. I take both into consideration. If they've a full bay and they're all quite sick. I will help them as much as I can. If they're quite stable patients. They are kind of used to the pressures. I think. Maybe they can handle their patients. I don't need to focus on you. Just now. One of the newly qualified or experienced staff. Just to make sure they're not drowning in their workload.
(Focus Group Five)

In this example, P1 talks about the decisions they make about who to help when they are the NIC. They suggest their decisions would depend on how much experience their team members have. In some circumstances they may leave the more experienced nurse with a higher workload and help the newly qualified nurse with a smaller workload. However, if both have the same amount of experience then they would help the nurse with the greatest workload. The need to pay attention to context highlights the complexity of the nursing team's everyday clinical work.

However, clinical experience and context were not enough to explain how nurses manage the complexity of their everyday clinical work. A lot of the decision making is internal to individuals and communicating this to other healthcare professionals is necessary for adaptations to be successful. The sub theme *Communication* represents the communication challenges the nursing team experience. Nurses report that some members of the team are better than others at communicating.

P2: [It's not always. Its. Um. It's not always the case that you are actually on top of it. Like you never know when you go out somewhere. Or they can ask you to get something. And then when you come back. Oh they've changed this. Oh this patient needs to be on half hourly. Or hourly. Or things like that. Ok. Sorry. Nobody told me. You just. You kind of a bit lost. In that. U:m. Time. And then you are wishing to go back. What else you can do.
F1: Right. So maybe you feel like you've missed something right at the beginning. And then things have changed. And now you're-
(Focus Group One)

All the nurses report using a considerable range of adaptations during the focus group discussions. For many of the adaptations to be carried out effectively they need the rest of the nursing team to be aware of them. This means communication is key for enabling successful adaptations. However, there is considerable variation in the effectiveness of communication between team members. The nursing staff often report poor communication between different members of the healthcare team. For example, healthcare assistants report poor communication between staff nurses and healthcare assistants. Staff nurses report poor communication between medical staff and staff nurses.

4.3.4 Learning From Each Other

The four resilience abilities are central to the RAG approach for analysing organisational resilience and the focus group script facilitated nursing staff to talk about responding, monitoring, learning and anticipating activities in their everyday clinical work. This was effective for discussing responding, monitoring and anticipating activities. However, it was challenging for the nursing team to discuss learning activities from a resilience engineering perspective, which focuses on learning from what goes right. When the researcher attempted to raise learning as a topic of discussion, the nurses associated learning with things that had gone wrong. In fact, the term 'learning' was not conducive to discussion. They talked about activities such as incident reporting or reflecting on what had gone wrong. Furthermore, many of the system level learning activities were conducted in another part of the hospital. For example, incident report investigations are conducted by a quality and safety team located in a different part of the hospital from the nursing staff. However, it became apparent that the focus groups provided a space for nursing staff to reflect on their work and this meant they could learn from each other.

> P2: No. Be. A lot of them [security staff] are based in A and E.
> P3: Oh are they?
> P2: So. It would be. That's something we could actually.
> F2: Mm.
> P2: Say to security. When you're responding to. Calls here. Please use the back door. Because.
> (Focus Group Six)

In this example, the nursing staff are talking about the different ways the security team work in the hospital. P2 and P3 have had different experiences interacting with the security staff. Together they talk about how this could change the way they work in the future. By discussing the way they manage their everyday clinical work, nursing staff shared their adaptations with each other. Sometimes this meant the more experienced nurses shared lessons from previous adaptations and sometimes this meant healthcare assistants sharing their adaptations with the staff nurses.

4.3.5 Being a Nurse on the AMU

As the nurses discussed how they manage the challenging elements of their work, they also provided insights into what it was like to experience them. The *Being a Nurse on the AMU* theme represents

these experiences. There are four sub themes associated with the *Being a Nurse on the AMU* and they are shown in Table 4-6.

Table 4-6 Sub themes associated with *Being a Nurse on the AMU* theme

Sub theme	Description
Lived Experience	What it is like to work as a member of the nursing team on AAW
Sense Perception	Nursing staff used a range of senses to gather information on the ward
Tension Between Roles	Nursing staff experienced tension between the different professional roles on the ward
When the work gets hard, you work harder	Prevailing attitude demonstrated across the nursing team in the face of challenging work

When the nurses talk about how they manage their work, they often mention how they use their senses to gather information about their clinical environment. The sub theme *Sense Perception* represents the different ways nursing staff experience their work using their senses.

> P2: Whereas. If you are walking through. And. Try and. Go into each bay. And. Eyeball. The patients. At least. Two or three times. Through the shift. And go into each zone. Regularly.
> P1: And make sure you assess someone as well.
> P2: Exactly. That's right.
> F1: Mm. I think. Some people. Have spoken about. When it's busy. You can feel that it is busy. The things that you see. The things that you hear. Allow you to. Kind of. Develop that understanding that. Maybe. Things aren't being as well controlled. As. They could be. Um. And. Sometimes. That's possible to do with these complex patients. See the behaviour that they're exhibiting. Or. The way that they're talking. You can hear the volume that they're using and talking to someone.
> (Focus Group Six)

Across the range of roles and experiences in the focus groups, the nurses report using their sight, hearing, smell and touch to gather information about the patients, the unit and the status of the workload of the nursing team. They also discuss the ability to '*feel that it is busy'.* This represents how nursing staff internalised the information they gathered through their senses and demonstrates their expertise for understanding their clinical environment at an almost subconscious level.

Many of the nurses used emotive language to talk about their work. It is clear they experience their everyday clinical work as human beings as well as healthcare professionals. It was inextricably linked to the ways they managed the challenges of their everyday clinical work. The sub theme *Lived Experience* represents what it feels like to be a nurse on the AMU.

> P2: And. It's difficult sometimes. When they are constantly asking you for it. Which is. Obviously their right. They want to go home. They don't want to be holding up the bed. Um. (2). And then that. Like. You do sometimes feel like. You are just nagging the doctor for it. Um. And you feel guilty for it. Because you know they are going to be seeing. They've prioritised that. It's not on the top of their list. Um. You do feel bad. For nagging.
> (Focus Group Eight)

A common theme is guilt. All the nurses expressed some sense of guilt when their adaptations require them to put pressure on other healthcare professionals to complete certain tasks, for example repeatedly asking the medical team to complete an electronic discharge letter. These adaptations are necessary to get the work done, but nursing staff still feel guilty about doing them.

The sub theme *Tension Between Roles* represents the tension between different the various healthcare disciplines.

> P2: Even today. I'm not. Happy. Because of the communication. I'm not getting the communication. It's not a two way thing. It really frustrates ME at work. Because. It should be a two way thing. Like. If I'm. Trying to catch up with you. And tell you this. This. Is done. And stuff like that. You should come back to me. And be like. This. This. This. Is done. Or maybe we should do this?
> F1: Mm.
> P2: If it's not a two way communication. I don't know how the other person feels. But it frustrates ME. Because I need information.
> (Focus Group Five)

The nurses agreed there was regular tension between the medical team and the nursing team. Nursing assistants frequently reported tension between nursing assistants and staff nurses. Both nursing assistants and staff nurses found poor communication to be a common source of tension between healthcare roles. Interaction with other healthcare professionals, the social component to working in a complex system, is a frequent source of tension between healthcare professionals. It often stemmed from conflicting priorities as system pressures pulled groups of healthcare professionals in different directions.

There is a shared attitude amongst the nursing staff on the AMU about how they approach the challenge of their everyday clinical work. The sub theme *When the work gets hard, you work harder* represents this shared attitude.

> F1: Yer. Because there is that feeling of. I just need to work harder to get through this.
> P3: Yer.
> F1: Its. Just. Like-
> P3: [Crack on.
> (Focus Group Three)

This attitude is a way for many of the nursing staff to manage the challenges of the everyday clinical work and the unpredictable nature of the workload particular to the AMU.

4.3.6 The Four Resilience Abilities

It is clear that the four resilience abilities are interrelated and happened simultaneously across micro, meso and macro levels. Consider the extract below:

> P1: Um. It. Depends. I mean. If it is a com. A more complex one. Then. You may get the doctors involved. To maybe have a. A chat. Sometimes. For whatever reason. People tend to heed a doctors advise more than nurses. Um. Or. If it. I mean. It's happened before. We've had patients. Who are. Kicking off a bit. Where we've asked SNP [Site Nurse Practitioner] to be involved. And then. It's been resolved by getting security to go out with them. And escort them. So they can. Have a cigarette. But also. They're not going to. Run away.
> (Focus Group Seven)

In this example, the nurses discuss how they manage challenging scenarios where clinically unstable patients, with mental health concerns want to go outside for a cigarette, against medical advice. They attempt to generate an effective solution, which balances the patient's wishes whilst maintaining their safety. The nurses anticipate the patient will more likely listen to the medical team than the nursing team, so they escalate to the medical team to talk to the patient. They've learnt that some patient's behaviour escalates quickly, so they monitor the patient's behaviour closely whilst they work towards an effective solution. They anticipate the need to escalate to the senior nurses in the hospital or the security team for more support if the patient's behaviour escalates. Crucially, it is only by understanding the way the nursing staff use elements of responding, monitoring, learning and anticipating at the same time, that it is possible to reach a deep enough understanding of resilient performance. In summary, the thematic analysis of the focus group data generated five themes which provided a comprehensive understanding of the Work-As-Done for nursing staff on the AMU. Part of the analysis involved using the CARe model of organisational resilience (Figure 1-1, p.29) and Hollnagel's four resilience abilities – responding, monitoring, learning and anticipating. The CARe model of organisational resilience was useful for structuring the high-level resilience concepts, such as demand and capacity. This was influential for understanding the salient challenges on the AMU, represented in the *Demand* and *Capacity* themes. However, the model was not sufficient for exploring the intricacies of the nurses' adaptations in more detail. The four resilience abilities informed a more nuanced analysis of the nurses' everyday clinical work.

4.4 Discussion

Phase one explored the research question ‘What is Work-As-Done for nurses?’ and ‘How can nurses’ Work-As-Done be understood in terms of the four resilience abilities?’’. Focus group discussions elicited rich descriptions about the challenging elements of the nurses’ everyday clinical work and proved a useful way to talk about the adaptations they employed to manage this. A theoretically informed, thematic analysis was effective for exploring the focus group data. There were two parts to this analysis, an initial deductive analysis informed by the CARe resilience model and then an inductive analysis, informed by the four resilience abilities. Both aspects provided valuable insights which allowed the analysis to move beyond what the nurses were saying and interpret their meaning to provide a thorough understanding of the Work-As-Done. The main findings from the thematic analysis were the level of complexity of the nurses’ everyday clinical work and the extent to which the social elements of this work were central for enabling adaptations. It was clear that talking about responding, monitoring, learning and anticipating activities was helpful for understanding how these adaptations worked and that the four resilience abilities are interrelated.

The *Demand* theme represented the most salient challenges for the nurses on the AMU. These were the system demands that they had to respond each shift. The *Capacity* theme represented the ways in which the healthcare system is organised to support the nursing staff to meet the system demands. However, it was clear that some elements of the *Capacity* theme were in themselves challenges. For example, staffing is a part of how the work is organised to meet the challenges in the *Demand* theme. However, many elements of staffing where themselves a challenge, such as short staffing or temporary staffing. This highlights the layers of complexity involved in the Work-As-Done for the nursing staff on the AMU. However, the activities and challenges in the *Capacity* theme were not sufficient to explain how the nurses met the challenges in the *Demand* theme. There were further levels of intricacy involved in their Work-As-Done. These nuances were represented in the *Clinical Expertise* theme, which showed how previous experiences, the particular context of a clinical scenario and the communication around adaptations all effected the nurses’ adaptations. The *Learning* theme was significant because it highlighted the lack of system support for learning from what goes right. It did demonstrate that the focus groups were themselves an effective time and place for the nurses to reflect and learn from each

other. The *Being a Nurse on the AMU* theme did not add to our understanding of how nurses enacted adaptations, but it captured the essence of the experience of being a nurse and constantly having to adapt to unpredictable demands.

The CARe organisational resilience model was useful for structuring the initial deductive element of the thematic analysis. It helped explain how the nurses' everyday clinical work is about re-aligning demand and capacity through adaptations. The focus group discussions supported the resilience engineering perspective that adaptations are necessary for effective system performance, but that the same adaptations lead to positive and negative outcomes (Hollnagel et al, 2015; Anderson et al, 2016). To reach a deep, granular understanding of specific activities that informed adaptations, a more inductive analysis, informed by the four resilience abilities was necessary. The CARe resilience model was helpful as an overarching framework to structure the initial analysis of these rich accounts, but further inductive analysis, using the four resilience abilities, was necessary to reach a more granular understanding of nurses' adaptations.

The focus group discussion focused on the work of individuals and teams, so it represents the micro and meso levels of system performance. However, the focus group accounts suggest that micro level performance directly affects meso level performance. For example, the nurses in the coordinating roles such as the NIC or the coordinator, talk about monitoring and anticipating activities that they do as individuals. Yet, these activities affect meso level performance such as effectiveness of patient flow though the AMU. This is represented in the *Clinical Expertise* theme, which is about the skills and knowledge that inform the adaptations nurses use to manage the challenges of their everyday clinical work. Although macro level performance is beyond the scope of the study, micro and meso level performances affect macro level performance. This supports the view that resilient performance occurs across all levels of complex systems (Anderson et al, 2017). This is not something that is well explained in resilience engineering theory, where there is a broad focus at systems level (Hollnagel et al, 2006; Hollnagel et al, 2015).

The social element of the adaptations for managing the complexity of everyday clinical work is considerable. One of the findings from the narrative review is that many approaches for analysing

organisational resilience are too technical and could not account for the social elements of resilient system performance (2.4.5, p.65). So, there was a preconception that understanding resilient system performance should account for the social processes, such as the coordination and articulation of work, negotiation of competing goals and dynamic trade-offs with other clinicians or patients (Wears & Perry, 2006; Ross et al, 2014; Sujan et al, 2015) that are vital for resilient system performance. The focus group discussions demonstrate that these social processes are central for enabling the adaptations nurses use to manage the complexity of their everyday clinical work. Even a simple adaptation, such as delaying the administration of a patient's antibiotics, needs to be communicated with other nursing team members involved in that patient's care. The complex and intricate nature of everyday clinical work means that many adaptations only work if other healthcare professionals know about them.

Focus group discussion identified there are no systems in place on the AMU to support learning from what goes right. When discussing learning in the focus groups, there was an overwhelming preoccupation with learning from things that went wrong. The *Learning From Each Other* theme shows that focus groups are an effective way for nursing staff to learn from each other. It is clear this was mutually beneficial and that there is no opportunity for nursing staff to do this on a regular basis due the demanding nature of the clinical work. Focus groups are known to be effective for sharing knowledge and information in a work setting. There is well established research about communities of practice and how they are useful for supporting organisational learning. Communities of practice are groups of people who share a concern, a set of problems or a passion about a topic and who deepen their knowledge and understanding in this area by interacting on a regular basis (Lave & Wenger, 1991; Weneger & Snyder, 2002). They are known to be effective for sharing tacit knowledge and have been used across several industries (Lesser & Storck, 2011). More recently, in healthcare, they have been used as a tool to improve clinical practice and to facilitate implementing evidence-based practice (Ranmuthugala et al, 2011). The evidence suggests they vary in composition, purpose and means by which members exchange information and knowledge. (Li et al, 2009; Ranmuthugala et al, 2011). Perhaps the focus groups were a good example of how to implement communities of practice with nursing staff of the AMU.

The lack of information about learning can be considered a limitation of this approach. It is difficult to analyse organisational resilience when there is incomplete information about one of the four central theoretical components. Especially if this initial phase will inform further phases for this process. It risks reinforcing the status quo, rather than being able to work towards improving resilient performance by looking at learning. However, separating the four resilience abilities reduces the explanatory power of the analysis. The findings demonstrated that the four abilities happen simultaneously across all levels. This is evidence to support interrelated nature of the theoretical relationships between the four resilience abilities (Hollnagel et al, 2006; Hollnagel, 2010). This means that, methodologically, it is not appropriate to study the four resilience abilities in isolation because they do not happen in isolation. Previous attempts at developing RAG questions have distinguished the four abilities (Hunte, 2016: Engvall et al, 2017), but this misses much of the complexity of the adaptations necessary for system performance.

The aim of phase one was to investigate the expert group's everyday clinical work to inform the development of items for a cross-sectional survey, which could explore the views of the wider nursing population on the AMU. However, not all the findings are relevant to the four resilience abilities and therefore not all the findings are relevant for developing survey items in the next phase of the research design. The *Demand* and *Capacity* themes are most relevant for this. The *Clinical Expertise* theme is more closely associated with individual performance, but its significance to the nursing staff's ability to manage their everyday clinical work suggested that it should be represented in the survey items. However, the absence of learning from things that went well meant that the focus group discussions are not an effective source for developing learning survey items. The *Phenomenology of Nursing* theme provides insight into what it is like to work as a nurse on the AMU. This theme is important for understanding the impact of the work on the people that make up the nursing teams. However, it is not relevant to the development of responding, monitoring, learning and anticipating survey items for analysing system performance. The next chapter begins with the development of a process for generating survey items from the focus group data.

4.5 Reflexivity

Conducting the focus groups was the most significant aspect of this phase of the research design. There was a considerable amount of planning to ensure the focus groups could be an effective research space to support discussion. Initially, the researcher was concerned it would be challenging to support the nurses to discuss their everyday clinical work from a resilience engineering perspective. The researcher was unsure how his pre-existing professional and social relationships with the nursing staff would affect the way the participants interacted in the focus groups. The researcher was also concerned that the resilience engineering theoretical terms would be a barrier to discussion because of the abstract and technical language of the resilience engineering field. Consequently, the researcher concentrated on explaining the purpose of focus groups without using resilience engineering terms and emphasised that the intention was to find out how the nurses manage the challenges of their work. Once the focus group participants understood the discussion was not an assessment, trust was established, and the collaboration began. The participants openly discussed the challenges of their work. The dual identity of clinician and researcher was a strength because the researcher knew when to prompt the participants to explain something further because they had experienced these challenges himself.

Despite the researcher's initial concerns, the focus groups were an overwhelming positive experience. The participants really engaged with each other and the discussion evolved into an open forum about the challenges of their everyday clinical work. Perhaps this was so effective because there was nowhere else they could express themselves in the same way. Surprisingly, there was a lot of laughter during the discussions. The focus groups created time and space for the participants to talk about their work, and the facilitators provided someone to listen to them. This was especially true of the healthcare assistants, who often feel marginalised by the nursing staff (as expressed in the focus groups). For the researcher, this represented effective collaboration with the nursing staff in the expert group. The resilient healthcare theoretical lens was useful for validating the nurses' experiences managing the challenges of their everyday clinical work.

The researcher found they were a participant in the focus groups as well as a facilitator. There were many instances where focus group discussion naturally aligned with resilience engineering theory,

without any prompting from the researcher. The four resilience abilities were helpful for understanding how nurses managed the complexity of their everyday clinical work. This was encouraging early in the research process because the value of the resilience engineering perspective was clear. When the discussion did not require much prompting, the researcher listened to the participants and added his thoughts to the discussion. The researcher learnt from his colleagues as they discussed various adaptations for managing the challenges of their everyday clinical work. This emphasised the value of the focus groups as means of exploring everyday clinical work because the insights gained from the collaborative discussion could not have been gained from the researcher's own reflections or individual interviews with nurses.

Chapter 5 – Phase Two – Item Development and Survey Application

Phase two explored the research question ‘How can the development of responding, monitoring, learning and anticipating survey items be informed by accounts of Work-As-Done?’. The aim of phase two was to develop survey items from the focus group data, administer the survey to the AMU nursing population and analyse the results. This represented a move from the expert group’s perspectives about managing their everyday clinical work, to exploring how well the whole nursing population thought the AMU could respond, monitor, learn and anticipate. By doing so, phase two was about using the detailed, nuanced accounts of the way individuals manage the challenging elements of their work, to analyse how well the AMU can respond, monitor, learn and anticipate. There was no useful guidance in the resilience engineering literature about using focus group data to inform survey items, so the researcher developed a replicable, systematic process for generating questions for the four resilience abilities.

5.1 Design

This was a quantitative study, which involved three parts: item development, survey administration and analysis of survey results. Item development involved making a conceptual leap from the focus group data, informed by resilience engineering theory, to items suitable for a self-administered survey. The intention was that the survey items explored the perspectives of the wider population of nursing staff about how well the AMU could respond, monitor, learn and anticipate. A cross-sectional survey design was used to collect data at a single point in time from the AMU nursing population. Surveys were self-administered and there were both, online and paper versions. A data analysis plan, developed in collaboration with the Faculty statistician, focused on descriptive statistical analysis of the survey data with the intention of exploring the relationships between the views of the different sub groups of the nursing population and any relationships between the survey items.

5.2 Method

5.2.1 Item Development

Survey design and item development are well established research endeavours (Aday & Cornelius, 2006; Brancato et al, 2006; Krosnick et al, 2014). Although it is desirable to use established survey items that have been developed and tested using rigorous methods (Reis & Judd, 2014; Krosnick et al, 2014), the RAG is designed to elicit information about a specific system and therefore a standardised questionnaire is not appropriate. Previous researchers have used different methods for developing RAG survey items, but these are either too close to the original theoretical items (Appendix A, p.210) (Hunte, 2016; Engvall et al, 2017) or include conceptual additions which were not sufficient for exploring organisational resilience (Van der Beek & Schraagen, 2015; Rigaud et al, 2015) (For more detail, see the RAG section of the narrative review findings, p.47). Therefore, there were no suitable existing survey items to draw upon, and no clearly described rigorous methods for generating items. In this study the focus group data informed the development of context specific survey items.

Developing survey items informed by the expert group's description of everyday clinical work was challenging because it involved making a conceptual leap from the focus group data, informed by resilience engineering theory, to items that were appropriate for a self-administered cross-sectional survey. The researcher, in collaboration with supervisors and subject experts, developed an nine-step process for generating responding, monitoring, learning and anticipating survey items from the thematic analysis of the focus group data. Decisions about the development of this process focused on making sure it was replicable, considering common barriers for local quality improvement initiatives such as lack of time and resources (Kaplan et al, 2010).

The challenge was to distil what was meaningful about the focus group data into a reasonable number of clear, unambiguous self-administered survey items. This necessarily involved reducing the detailed accounts of the focus groups into simpler statements to explore the views of the wider population and was part of a three-stage process to comprehensively explore the organisational resilience of the AMU. Figure 5-1 shows a flow chart of this process and each step is described in more detail in the following section.

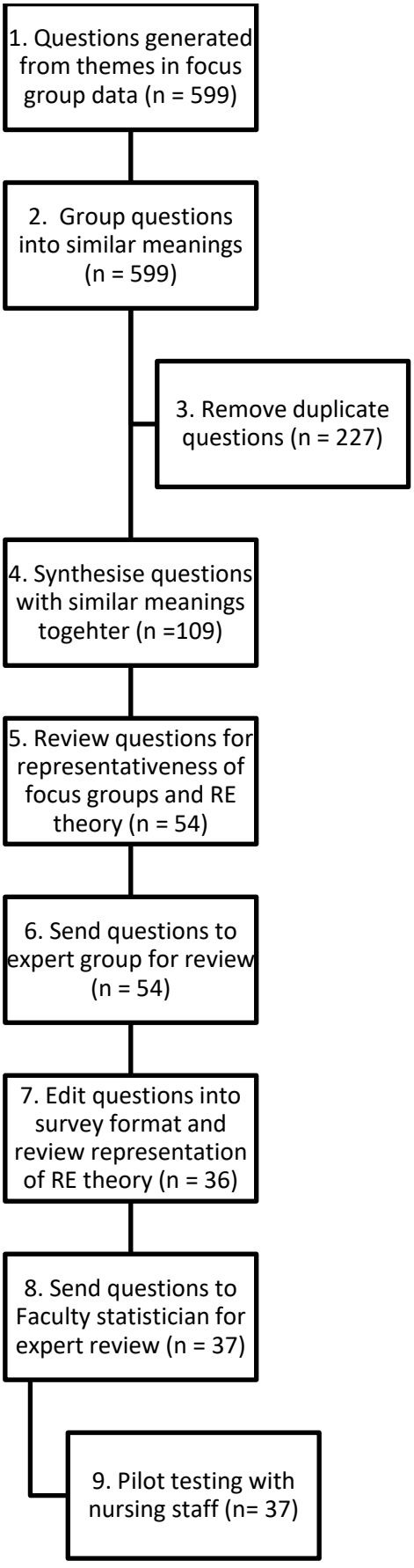

Figure 5-1 Flowchart for Question Development in Phase Two

5.2.1.1 Step One – Generate Questions from Focus Group Data

There were five main themes (*Demand*, *Capacity, Clinical Expertise, Reflection* and *Being a Nurse on the AMU)* from the thematic analysis of the focus group data in phase one. The researcher re-read the data for each theme and then, starting from the first theme, generated questions, line-by-line, from the contents of the theme. The questions were written as comments in Microsoft Word documents. Figure 5-2 shows an example of this question generation process. In total, 599 questions were generated from this step (Appendix E, p.218). The next steps focused on reducing the number of questions into a feasible number for a self-administered, cross-sectional survey.

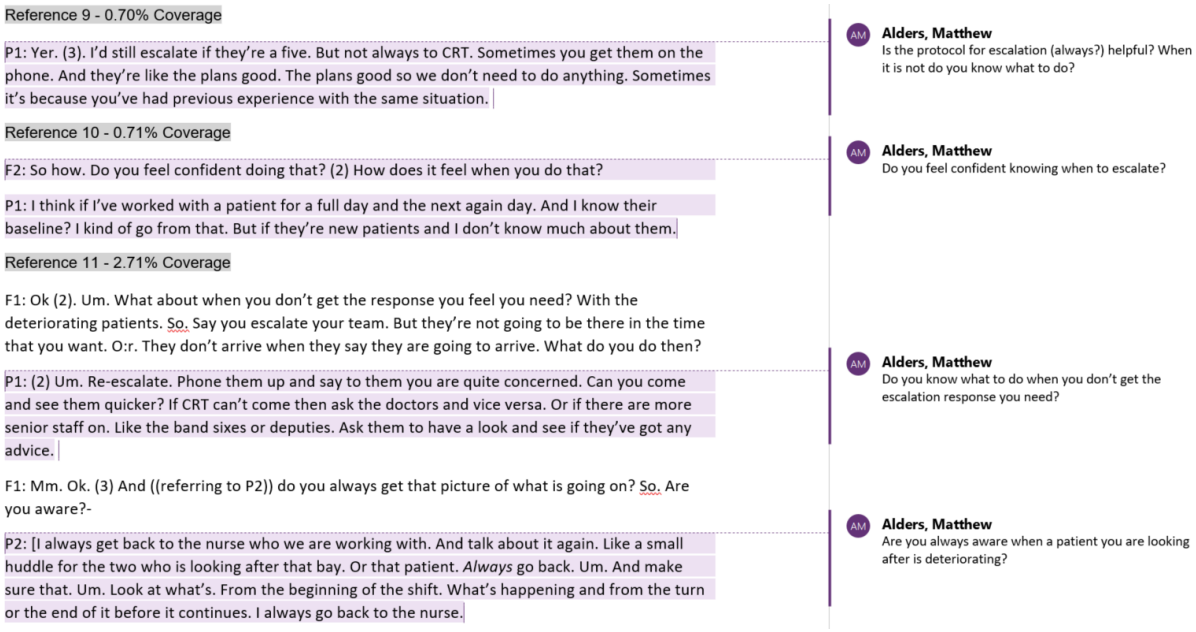

Figure 5-2 Example of Generating Questions from Deteriorating Patient Theme

5.2.1.2 Step Two – Group Questions Together with Similar Meanings

The researcher printed out the questions and arranged them on a large flat surface to group them into similar topics, for example some of the topics from the deteriorating patient theme were escalating deteriorating patients, responding to unwell patients and communicating with the medical team. This allowed the researcher to better understand the relationships between the questions and identify any overlap between them.

Figure 5-3 Picture of Questions Grouped into Similar Meanings

5.2.1.3 Step Three – Remove Duplicate Questions

There was considerable overlap between most of the groups of questions and to reduce this overlap, 227 duplicate questions were removed (Appendix F, p.231).

5.2.1.4 Step Four – Synthesise Similar Questions

There was still considerable similarity between many of the remaining questions, especially those within the same group. To reduce this similarity, the researcher synthesised questions with similar meanings into a single question. Table 5-1 shows an example of this process, where five questions were synthesised into one question. After this step was finished, there were 109 questions (Appendix G, p.237).

Table 5-1 Example of Process for Reducing Overlap Between Questions

Questions informed by thematic analysis of focus group data	Synthesised question
Do you ask for help from other members of the team when you are supporting the behaviour of a challenging patient?	Do you feel confident knowing when to escalate a patient with challenging behaviour?
Do you know when to ask for help with a challenging patient?	
When you are getting frustrated with a challenging patient do you tell someone else?	
Do you know when to ask for help with challenging patients or patients with mental health needs?	

5.2.1.5 Step Five – Review Questions for Representation of Focus Group Discussion and RE Theory

In collaboration with supervisors and subject experts, the researcher reviewed how well the questions represented the focus group discussions. Some questions represented elements of discussion that had only been raised once, whereas some questions represented core themes which continually emerged. The researcher removed 55 questions which did not represent the core themes of the discussions (Appendix H, p.240). 54 questions remained.

5.2.1.6 Step Six – Send Questions to Expert Group for Review

The expert group were asked to review the remaining 54 questions for relevance to their everyday clinical work and the accessibility of the language for the wider nursing population on the AMU. The researcher sent expert group an online survey (Appendix I, p.242) and emphasised reviewing the questions from a system rather than individual perspective. The survey asked the expert group to rate the questions according to a four-point Likert scale from 'Definitely don't include' to 'Definitely include'. Each question had a suggestion box, which the expert group could use to provide feedback about the questions. Figure 5-4 shows an example of how these questions were presented to the focus group participants. Seven out of the fifteen focus group participants completed this survey. Many commented that there should be fewer questions. Questions with a median score of four (representing 'Definitely include' response category) were taken forward to the next stage. 36 questions remained (Appendix J p.261).

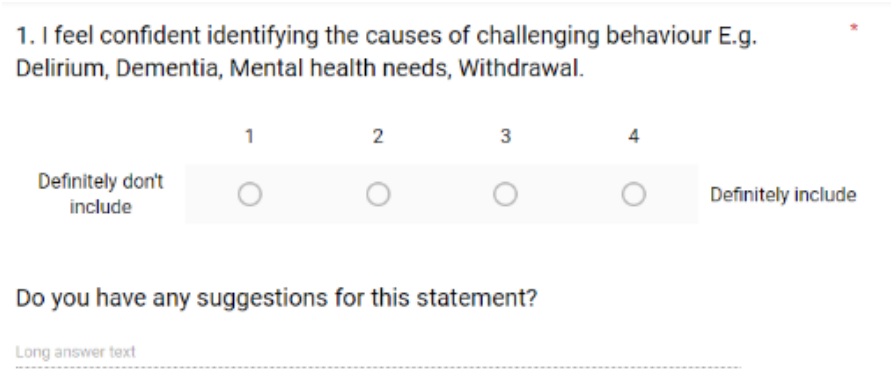

Figure 5-4 Example of Survey Items Sent to Focus Group Participants for Review

5.2.1.7 Step Seven – Edit Questions into Survey Format and Review Representation of Resilient Healthcare Theory

Self-administered surveys should be clear and simple because researchers are not present whilst participants complete them (de Vaus et al, 2013). The researcher edited the questions to ensure that the survey items were unambiguous and representative of resilient healthcare theory (Krosnick et al, 2014). This was an iterative process, involving several cycles of editing and reflection, which involved the researcher and supervisors. Four of the items became increasingly less relevant to resilience engineering theory as they were edited, and the researcher removed these from the survey.

There were five response categories for each survey item because this provided sufficient measure of intensity and direction of opinion, without overloading the respondent with too many choices and increasing the risk of item non-response (Krosnick et al, 2014). The five response categories were 'Poor', 'Fair', 'Good', 'Very Good' and 'Excellent'.

Most of the discussion in the focus groups was about activities associated with responding, with less discussion about monitoring or anticipating and very little discussion about learning. The little discussion about learning was focused on learning from things that had gone wrong. Using the focus groups as a basis for developing survey items risks reinforcing the status quo, since the survey could only then represent the current state of the system, not what should be there. To reduce the effects of this limitation, resilience engineering theory was used to add questions about learning. Since learning is one of the four resilience attributes and central to the RAG framework for analysing organisational resilience, the researcher and supervisors decided that learning from things that go right should be represented in the survey items. Five additional items were developed by the researcher and supervisors to represent learning. These items were informed by resilience engineering theory and local knowledge of the clinical area:

1. Communicating the learning from things that have gone well, despite challenges
2. Changing practice in response to learning from incident reports (Datix/IR1)
3. Communicating the learning from incident reports (Datix/IR1)
4. Reporting adverse incidents e.g. patient fall, aggressive behaviour, medicine administration error
5. Changing practice in response to learning from things that have gone well

In total, there were 37 survey items.

5.2.1.8 Step Eight – Review by Faculty Statistician

The Faculty statistician reviewed the survey and provided feedback to improve its layout. This included randomising the items, so they were not presented in order of responding, monitoring, learning and anticipating, and advice about the layout of the initial demographic questions. The college statistician and researcher developed a data analysis plan (presented in 5.2.3 Data Analysis p.133).

5.2.1.9 Step Nine – Pilot Testing

Three members of the nursing team (not involved in initial focus groups) pilot tested the survey. The researcher asked them to complete the survey, encouraged them to 'think aloud' and verbalise their thoughts as they completed the survey (Krosnick et al, 2014). Several items were edited in response to their feedback to make them more accessible to nursing staff on the AMU.

The final survey had three demographic questions asking the participant's role, how long they had been qualified and how long they had been working on the AMU. As well as 37 items about responding, monitoring, learning and anticipating activities on the AMU. There were 23 items about responding, six items about monitoring, five items about learning and three items about anticipating (Appendix K p.263).

5.2.2 Data collection

The survey was administered to the whole the AMU nursing population (n=77). Data collection lasted four weeks. Nursing staff were sent an initial email explaining the context of the study and asking them to complete a survey, this email contained a link to complete the survey online. Paper versions of the survey were placed in a labelled box at the main nursing station on the AMU. The researcher visited the unit in the evenings, four times a week to ask nursing staff to complete a survey. This was a good time to be present on the unit because it enabled contact with both day and night shift staff.

In total 55 surveys were completed, 13 surveys were completed online, and 42 surveys were completed on paper. Only two participants provided incomplete survey responses and the missing data were treated as missing completely at random. They were handled using pairwise deletion. All statistical analysis was done with IBM SPSS Statistics 24.

5.2.3 Data Analysis

The data analysis plan developed with the college statistician recognised that the small population size (n=77) limited the statistical tests of the survey data. There were five parts to the data analysis plan:

1. Calculate the total number of participants in each sub-group of the survey population by nursing role, length of time qualified and length of time on the AMU.
2. Calculate the Cronbach's Alpha for all items and for each of the four resilience abilities.
3. Calculate a mean score for all items, for each of the four resilience and for each individual item.
4. Compare the overall mean scores of each of the four resilience abilities with the mean scores for each sub-group in the survey population
5. Calculate a correlation matrix of all the survey items to explore relationships between them.

The Likert style data were treated as ordinal because the difference between 'poor' and 'fair' cannot necessarily be treated as the same size as the difference between 'very good' and 'excellent'. So, the researcher used Spearman's rank order correlation test to explore relationships between participants' views (Bryman & Cramer, 2012).

The small population size meant it was inappropriate to conduct psychometric testing or inferential statistical analysis on the survey data. However, this was not considered a limiting factor for this process. The data analysis plan aligned with the aims of this quantitative phase of the study by focusing on exploring the views of the wider AMU nursing population about how well the system could respond, monitor, learn and anticipate. It also examined the relationships between these views and the scores of the survey items to try and uncover some of the complexity of system performance on the AMU.

Further data analysis was not necessary for achieving these aims and was not considered to align with resilience engineering theory.

5.3 Findings

5.3.1 Study population

The response rate was 71%, with 55 out of 77 of the AMU nursing population represented in the survey results. Table 5-2 shows the different staff groups of the study population, Table 5-3 shows the length of time the study population had been qualified by staff group and Table 5-4 shows the length of time the study population had worked on the AMU by staff group.

Table 5-2 Nursing Staff Groups of the Study Population

Staff Group	Number of staff who completed surveys	Number of staff on AMU	Percent of staff group
Nursing Assistant (Band 2-3)	14	21	66.7%
Staff Nurse (Band 5)	23	27	85%
Senior Staff Nurse (Band 5)	8	12	66.7%
Junior Sister/Charge Nurse (Band 6)	6	9	66.7%
Deputy Ward Manager (Band 6)/ Ward Manager (Band 7)	4	8	50%
Total	55	77	71.4%

Note. Refer to Table 3-1, p.83 to clarify the different roles and responsibilities of the AMU nursing team

Table 5-3 Length of Time Qualified by Staff Group

Staff Group	Length of time qualified				Missing Data	Total number of participants	Percent of survey population
	Less than 1 year	From 1 year to 2 years	From 3 years to 4 years	5 years +			
Nursing Assistant (Band 2-3)	2	2	2	7	1	14	25.5%
Staff Nurse (Band 5)	10	7	3	2	1	23	41.8%
Senior Staff Nurse (Band 5)	1	4	2	1	-	8	14.5%
Junior Sister/Charge Nurse (Band 6)	-	-	2	4	-	6	10.9%
Deputy Ward Manager (Band 6)/ Ward Manager (Band 7)	-	-	1	3	-	4	7.3%

Table 5-4 Length of Time on the AMU by Staff Group

Staff Group	Length of time on the AMU				Missing Data	Total number of participants	Percent of survey population
	Less than 1 year	From 1 year to 2 years	From 3 years to 4 years	5 years +			
Nursing Assistant (Band 2-3)	5	4	3	2	-	14	25.5%
Staff Nurse (Band 5)	15	7	-	-	1	23	25.5%
Senior Staff Nurse (Band 5)	-	7	-	1	-	8	14.5%
Junior Sister/Charge Nurse (Band 6)	-	1	3	2	-	6	10.9%
Deputy Ward Manager (Band 6)/ Ward Manager (Band 7)	-	1	1	2	-	4	7.3%

There was good distribution of nursing staff at different grades, which was important for gaining different perspectives on the system. The staff nurses and senior staff nurses were the most well represented. The nursing assistants and deputy ward manager/ward manager groups were the least well represented. Most participants were junior nursing staff and had worked on the AMU for a short time. This suggested there was a junior nursing workforce on the AMU.

5.3.2 Means, Standard Deviations, Ranges, Cronbach's Alphas for the Four Resilience Abilities

Table 5-5 shows the overall mean score for all survey items (including standard deviation), the mean scores for the four resilience abilities (including standard deviation), and the overall Cronbach's Alpha coefficient for all survey items and for the four resilience abilities.

Table 5-5 Summary of Means, Standard Deviations, Ranges, Cronbach's Alpha for Survey Items of the Four Resilience Abilities

Subscale	Number of items	Cronbach's Alpha	Item	Mean (SD)	Range
All Items	**37**	**0.95**	**-**	**3.75 (0.42)**	**4**
Responding	**23**	**0.91**	**-**	**3.84 (0.45)**	**4**
			Escalating a deteriorating patient to the multi-disciplinary team	4.50 (0.77)	3
			Knowing what to do when a patient is deteriorating	4.37 (0.83)	3
			Informing senior nursing colleagues when there are concerns about a patient	4.33 (0.80)	3
			Judging when to escalate a patient to more senior colleagues if the clinical picture is unclear	4.22 (0.83)	4
			Identifying the causes of challenging behaviour e.g. Delirium, dementia, withdrawal	4.11 (0.85)	3
			Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends	4.09 (0.78)	3
			Working effectively as a team	4.07 (0.90)	4
			Supporting colleagues when responding to aggressive patients	4.06 (1.00)	4
			Handing over a patient with challenging behaviour to the next shift	4.06 (0.83)	3
			Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team	4.02 (0.94)	3
			Identifying the causes of a patient's clinical deterioration	3.96 (0.73)	3
			Informing all members of the nursing team in a zone about a patient with challenging behaviour	3.96 (0.98)	4
			Raising concerns about discharging a patient home if this is unsafe	3.94 (0.83)	4
			Knowing what to do if the medical team's response to escalating a deteriorating patient is insufficient	3.87 (0.91)	3
			Supporting staff to develop new skills	3.87 (1.03)	4
			Coordinating with the multidisciplinary team to facilitate the complex discharge of a patient	3.83 (0.80)	3
			Communicating with all members of the nursing team about patient care during a shift	3.80 (0.87)	3
			Providing additional help if someone has too much to do	3.60 (1.12)	4

Subscale	Number of items	Cronbach's Alpha	Item	Mean (SD)	Range
Responding	**23**	**0.91**	-	**3.84 (0.45)**	**4**
			Agreeing the allocation of tasks between colleagues working in the same bay	3.56 (0.88)	4
			Supporting patients with mental health needs	3.31 (1.04)	4
			Changing staffing allocation during a shift in response to changed workloads	3.15 (1.20)	4
			Involving nursing team members in assessing a patient's mental capacity	3.07 (1.10)	4
			Including registered mental health nurses (RMNs) during handover to support a patient with mental health needs	2.59 (1.24)	4
Monitoring	**6**	**0.76**	**-**	**3.41 (0.35)**	**4**
			Knowing when nursing colleagues in your zone need help	3.80 (0.82)	4
			As a zone, adapting to changed priorities throughout the shift	3.71 (0.85)	3
			Having huddles to understand the workload of the zone	3.53 (0.81)	4
			Informing team members when there are new admissions coming into the zone	3.42 (1.01)	4
			Coordinating patient transfers from different zones to the same destination	3.02 (1.11)	4
			Knowing how busy other zones are compared to yours	2.96 (0.98)	4
Learning	**5**	**0.80**	**-**	**3.70 (0.19)**	**4**
			Reporting adverse incidents e.g. patient fall, aggressive behaviour, medicine administration error	4.02 (0.84)	3
			Changing practice in response to learning from incident reports (Datix/IR1)	3.72 (1.01)	4
			Changing practice in response to learning from things that have gone well	3.61 (0.92)	4
			Communicating the learning from incident reports (Datix/IR1)	3.57 (1.07)	4
			Communicating the learning from things that have gone well, despite challenges	3.57 (1.02)	4
Anticipating	**3**	**0.73**	**-**	**3.79 (0.23)**	**4**
			Identifying when the workload on the next shift will be high	4.02 (1.01)	4
			Providing the right information to appropriately prepare for new admissions	3.80 (0.81)	3
			Taking action to reduce workload for the next shift	3.56 (1.00)	4

It was clear that nursing staff considered the AMU to be most effective at responding (3.84) and least effective at monitoring (3.41), with anticipating (3.79) and learning (3.70) between them. The items with the highest mean scores were responding items associated with escalating and managing deteriorating patients. The items with the lowest mean scores were responding items associated with supporting mental health patients.

Cronbach's Alpha values from 0.7 to 0.8 were considered to show good levels of internal consistency (Bland & Altman, 1997; Tavakol & Dennick, 2011). Cronbach's Alpha values greater than 0.9 were considered high, suggesting redundancy between survey items (Tavakol & Dennick, 2011, John & Benet-Martinez, 2014). Responding items had a high level of internal consistency (α .91). The other resilience abilities, monitoring (α .76), learning (α .80) and anticipating (α .73) demonstrated good levels of internal consistency.

5.3.3 Comparing Mean Resilience Scores for Sub groups of the AMU Nursing Population

Table 5-6 compares the overall mean scores for the four resilience abilities with the mean scores of each of the sub-groups of the nursing population. The results show that junior staff nurses rated the AMU's ability to respond, monitor, learn and anticipate lower than the senior nursing staff.

Table 5-6 Resilience Ability Mean Scores by Staff Group

Subscale	Overall mean score	Nursing Assistant	Staff Nurse	Senior Staff Nurse	Junior Sister/Charge Nurse	Deputy Ward Manager/Ward Manager
Responding	3.84	3.77	3.89	3.77	3.79	4.07
Monitoring	3.41	3.52	3.37	3.23	3.28	3.83
Learning	3.70	3.73	3.70	3.53	3.63	4.00
Anticipating	3.79	3.76	3.82	3.63	3.72	4.17

Table 5-7 compares the overall mean score for the four resilience abilities with the mean scores of each of the sub-groups of nursing staff by the length of time they had been qualified. Nursing staff that had been qualified from one to two years reported the lowest mean scores for all four resilience attributes.

Table 5-7 Resilience Ability Mean Scores by Length of Time Qualified

Subscale	Overall mean score	Qualified less than 1 year	Qualified from 1 year to 2 years	Qualified from 3 years up to 4 years	Qualified 5 years +
Responding	3.84	3.98	3.72	3.94	3.78
Monitoring	3.41	3.51	3.13	3.48	3.52
Learning	3.70	3.69	3.48	3.80	3.83
Anticipating	3.79	3.90	3.38	4.17	3.80

Table 5-8 compares the overall mean score of the four resilience abilities with the mean scores of each of the sub-groups of nursing staff by length of time they had worked on the AMU. Nursing staff that have worked on the unit from three to four years reported the highest mean score for all four resilience attributes.

Table 5-8 Resilience Ability Mean Scores by Length of Time on the AMU

Subscale	Overall mean score	Worked on the ward less than 1 year	Worked on the ward from 1 year up to 2 years	Worked on the ward from 3 years up to 4 years	Worked on the ward 5 years + (since it opened)
Responding	3.84	3.80	3.81	4.16	3.75
Monitoring	3.41	3.30	3.32	3.93	3.43
Learning	3.70	3.60	3.68	4.03	3.68
Anticipating	3.79	3.65	3.87	4.19	3.57

The tables show that the senior staff nurses, who had been qualified and worked on the AMU for one to two years reported the lowest scores for the unit's ability to respond, monitor, learn and anticipate. These were the senior band five staff nurses, who were regularly the NIC of a zone. They focused on coordinating nursing work in a zone and were often involved with the most unwell or challenging patients. The deputy ward managers/ward managers reported the highest mean scores for the AMU's ability to respond, monitor, learn and anticipate. Generally, it was the most senior nurses who had worked on the unit the longest who rated the AMU's ability to conduct the four resilience abilities the highest. The longer a nurse worked on the unit, the higher rating they gave the unit to conduct the four resilience abilities.

5.3.4 Correlations Between Survey Items

The researcher used Spearman's rank order correlation test to examine relationships between the 37 survey items as recommended for ordinal data (Bryman & Cramer, 2012). The researcher used Cohen's categorisations of small, medium and large effect sizes to interpret the strength of

the relationship between survey items; a small association was 0.1, a medium association was 0.3 and a large association was 0.5 (Cohen, 1988). All the associations were positive. There were a considerable number of small and medium associations. There were fewer large associations and the analysis focused on these larger associations because they provided a more reliable insight into the relationships between the survey items. The complete correlation matrix can be found in Appendix L, p.269. Including it in this section was too cumbersome, instead tables of the survey items with large associations for each of the four resilience abilities are presented below. Table 5-9 shows the responding items with correlations greater than 0.5.

Table 5-9 Correlations Greater Than 0.5 Between Responding Items and Other Survey Items

Responding Survey Items	Survey items with greater than 0.5 correlations (Resilience attribute)
Judging when to escalate a patient to more senior colleagues if the clinical picture is unclear	Escalating a deteriorating patient to the multi-disciplinary team (responding) Informing senior nursing colleagues when there are concerns about a patient (responding) Reporting adverse incidents e.g. patient fall, aggressive behaviour, medicine administration error (learning)
Coordinating with the multidisciplinary team to facilitate the complex discharge of a patient	Changing staffing allocation during a shift in response to changed workloads (responding)
Escalating a deteriorating patient to the multi-disciplinary team	Identifying the causes of a patient's clinical deterioration (responding) Knowing what to do when a patient is deteriorating (responding) Informing senior nursing colleagues when there are concerns about a patient (responding) Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team (responding)
Knowing what to do if the medical team's response to escalating a deteriorating patient is insufficient	Knowing what to do when a patient is deteriorating (responding) Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team (responding)
Involving nursing team members in assessing a patient's mental capacity	Supporting patients with mental health needs (responding) Changing practice in response to learning from things that have gone well (learning)
Identifying the causes of a patient's clinical deterioration	Knowing what to do when a patient is deteriorating (responding) Identifying the causes of challenging behaviour e.g. Delirium, dementia, withdrawal (responding)
Providing additional help if someone has too much to do	Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends (responding) Communicating with all members of the nursing team about patient care during a shift (responding) Working effectively as a team (responding) Knowing when nursing colleagues in your zone need help (monitoring) Informing team members when there are new admissions coming into the zone (monitoring) Changing practice in response to learning from things that have gone well (learning) Taking action to reduce workload for the next shift (anticipating)

Changing staffing allocation during a shift in response to changed workloads	Identifying the causes of challenging behaviour e.g. Delirium, dementia, withdrawal (responding) As a zone, adapting to changed priorities throughout the shift (monitoring) Changing practice in response to learning from incident reports (Datix/IR1) (learning) Changing practice in response to learning from things that have gone well (learning) Reporting adverse incidents e.g. patient fall, aggressive behaviour, medicine administration error (learning) Taking action to reduce workload for the next shift (anticipating)
Knowing what to do when a patient is deteriorating	Informing senior nursing colleagues when there are concerns about a patient (responding) Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team (responding) Knowing when nursing colleagues in your zone need help (monitoring) As a zone, adapting to changed priorities throughout the shift (monitoring) Identifying when the workload on the next shift will be high (anticipating)
Identifying the causes of challenging behaviour e.g. Delirium, dementia, withdrawal	Working effectively as a team (responding) Changing practice in response to learning from incident reports (Datix/IR1) (learning)
Including registered mental health nurses (RMNs) during handover to support a patient with mental health needs	Supporting patients with mental health needs (responding)
Informing senior nursing colleagues when there are concerns about a patient	Informing all members of the nursing team in a zone about a patient with challenging behaviour (responding) Supporting staff to develop new skills (responding) Knowing when nursing colleagues in your zone need help (monitoring) Identifying when the workload on the next shift will be high (anticipating)
Supporting colleagues when responding to aggressive patients	Knowing when nursing colleagues in your zone need help (monitoring)
Supporting patients with mental health needs	Communicating the learning from incident reports (Datix/IR1) (learning)
Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team	Handing over a patient with challenging behaviour to the next shift (responding) Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends (responding) As a zone, adapting to changed priorities throughout the shift (monitoring) Communicating the learning from incident reports (Datix/IR1) (learning) Identifying when the workload on the next shift will be high (anticipating) Taking action to reduce workload for the next shift (anticipating)
Handing over a patient with challenging behaviour to the next shift	Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends (responding) As a zone, adapting to changed priorities throughout the shift (monitoring) Identifying when the workload on the next shift will be high (anticipating) Taking action to reduce workload for the next shift (anticipating)
Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends	As a zone, adapting to changed priorities throughout the shift (monitoring) Changing practice in response to learning from things that have gone well (learning) Taking action to reduce workload for the next shift (anticipating)
Working effectively as a team	Supporting staff to develop new skills (responding) Knowing when nursing colleagues in your zone need help (monitoring)

Informing all members of the nursing team in a zone about a patient with challenging behaviour	Communicating the learning from incident reports (Datix/IR1) (learning) Communicating the learning from things that have gone well, despite challenges (learning)
Supporting staff to develop new skills	Agreeing the allocation of tasks between colleagues working in the same bay (responding) Knowing when nursing colleagues in your zone need help (monitoring)
Agreeing the allocation of tasks between colleagues working in the same bay	Knowing when nursing colleagues in your zone need help (monitoring) Changing practice in response to learning from things that have gone well (learning)

From the table, it can be seen there are complex, relationships between the responding survey items. For instance, the responding item *Escalating a deteriorating patient to the multi-disciplinary team* has large associations with other responding items and this suggests that escalating a deteriorating patient to the multidisciplinary team effectively means the nursing staff need to know when a patient is deteriorating, who they should escalate to and when they should do it. Responding activities are often strongly associated with a web of interrelated activities. Doing one of these activities effectively depended on doing a group of them effectively. And people seemed to think that if the unit was good at one of them, it was good at all of them.

These relationships become more complex when considering the large associations between responding survey items and survey items associated with the other resilience abilities. For example, the responding item *Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team* had large associations with two responding items, one monitoring item, one learning item and two anticipating items. This suggests that to effectively escalate a deteriorating patient who has just arrived from the ED, the unit needs systems to monitor when it needs to adapt to new clinical priorities, communicate the learning when these things have happened in the past and anticipate what this will mean for the nursing staff on the next shift. This supports the view that the four resilience abilities are interrelated (Hollnagel, 2010). The four abilities do not happen in isolation and support each other's effectiveness.

There was a clear direction for the relationship between monitoring survey items and anticipating survey items. Monitoring survey items only had large associations with anticipating items. Table 5-10 shows the monitoring items with correlations greater than 0.5.

Table 5-10 Correlations Greater Than 0.5 Between Monitoring Items and Other Survey Items

Monitoring Survey Items	Survey items with greater than 0.5 correlations (Resilience attribute)
Knowing when nursing colleagues in your zone need help	Identifying when the workload on the next shift will be high (anticipating) Taking action to reduce workload for the next shift (anticipating)
As a zone, adapting to changed priorities throughout the shift	Identifying when the workload on the next shift will be high (anticipating) Taking action to reduce workload for the next shift (anticipating)
Knowing how busy other zones are compared to yours	Taking action to reduce workload for the next shift (anticipating)
Informing team members when there are new admissions coming into the zone	Providing the right information to appropriately prepare for new admissions (anticipating)

Learning items had large associations with other learning items and responding items. Table 5-11 shows the Learning items with correlations greater than 0.5.

Table 5-11 Correlations Greater Than 0.5 Between Learning Items and Other Survey Items

Learning Survey Items	Survey items with greater than 0.5 correlations (Resilience attribute)
Communicating the learning from incident reports (Datix/IR1)	Communicating the learning from things that have gone well, despite challenges (learning) Changing practice in response to learning from incident reports (Datix/IR1) (learning)
Communicating the learning from things that have gone well, despite challenges	Informing all members of the nursing team in a zone about a patient with challenging behaviour (responding) Communicating the learning from incident reports (Datix/IR1) (learning)
Changing practice in response to learning from incident reports (Datix/IR1)	Changing staffing allocation during a shift in response to changed workloads (responding) Including registered mental health nurses (RMNs) during handover to support a patient with mental health needs (responding) Communicating the learning from incident reports (Datix/IR1) (learning) Communicating the learning from things that have gone well, despite challenges (learning)
Changing practice in response to learning from things that have gone well	Involving nursing team members in assessing a patient's mental capacity (responding) Providing additional help if someone has too much to do (responding) Changing staffing allocation during a shift in response to changed workloads (responding) Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends (responding) Agreeing the allocation of tasks between colleagues working in the same bay (responding) Changing practice in response to learning from incident reports (Datix/IR1) (learning)
Reporting adverse incidents e.g. patient fall, aggressive behaviour, medicine administration error	Judging when to escalate a patient to more senior colleagues if the clinical picture is unclear (responding) Changing staffing allocation during a shift in response to changed workloads (responding)

The learning items associated with changing practice demonstrated more complex relationships with other survey items than the items associated with communicating learning. This suggests that changing practice is a more complex activity than communicating learning.

Anticipating items had large associations with other anticipating items, responding items and monitoring items. Table 5-12 shows the anticipating items with correlations greater than 0.5.

Table 5-12 Correlations Greater Than 0.5 Between Anticipating Items and Other Survey Items

Anticipating Survey Items	Survey items with greater than 0.5 correlations (Resilience attribute)
Identifying when the workload on the next shift will be high	Taking action to reduce workload for the next shift (anticipating)
Taking action to reduce workload for the next shift	Providing additional help if someone has too much to do (responding) Changing staffing allocation during a shift in response to changed workloads (responding) Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team (responding) Handing over a patient with challenging behaviour to the next shift (responding) Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends (responding) Knowing when nursing colleagues in your zone need help (monitoring) As a zone, adapting to changed priorities throughout the shift (monitoring) Knowing how busy other zones are compared to yours (monitoring) Identifying when the workload on the next shift will be high (anticipating)
Providing the right information to appropriately prepare for new admissions	Informing team members when there are new admissions coming into the zone (monitoring)

The item *Taking action to reduce workload for the next shift* had more strong associations with other survey items than the other anticipating survey items.

5.4 Discussion

Phase two explored the research question ‘How can the development of responding, monitoring, learning and anticipating survey items be informed by accounts of Work-As-Done?’. The aim of phase two was to develop survey items from the focus group data, administer the survey to the AMU nursing population and analyse the results. The beginning of phase two showed that it was feasible to develop a replicable, systematic process for generating responding, monitoring, learning and anticipating survey items from focus group accounts of everyday clinical work. The

survey results provided new insights for understanding resilient system performance on the AMU, building on the detailed accounts of everyday clinical work from the focus groups in phase one to reach a more comprehensive picture of resilient healthcare on the AMU. It was clear that nursing staff thought the AMU was the most effective at responding, the least effective at monitoring, with learning and anticipating somewhere in between. The survey results showed that there were consistent differences in opinion between the different nursing sub-groups. The results also provided insights into the conceptual relationship between the four resilience abilities, adding further support for their intricate interrelatedness (Hollnagel, 2015).

This study showed it is feasible to develop a systematic and replicable process for generating responding, monitoring, learning and anticipating survey items specific to a given healthcare system. There are clearly documented outcomes at each step and this means that other researchers or healthcare professionals could generate survey items for their healthcare system by following the same process. However, there is a strong imbalance in the number of items for each of the four resilience abilities. The focus group discussions in phase one suggest that most of the nursing work on the AMU is about responding and this means that most of the survey items are about responding. The survey results indicate how much the system (from a nursing perspective) focuses on responding and the AMU does not have a balance between the four resilience abilities. Theoretically, this limits the AMU's potential for resilient performance (Hollnagel, 2010). However, it is unclear what the balance of the four resilience abilities should be. Resilience engineering theory recognises that different systems need different balances between the four resilience abilities (Hollnagel, 2010), but it does not provide any suggestion for understanding what the balance needs to be for a given system. This diagnostic element of the process is something that previous applications of the RAG have been unable to achieve. The original questions (Appendix A, p.210) had a balance between the four resilience abilities and previous applications informed by this approach (Hunte, 2016; Engvall, 2017), had similar numbers of questions for each of the four resilience abilities. By generating survey items from discussions with frontline healthcare professionals, the number of survey items themselves are part of the process for analysing organisational resilience of the AMU.

Generating survey items from focus group discussion is challenging when participants' views are constrained by their current experiences. This was evident when generating the learning survey items. Learning is one of the four resilience attributes and central to the potential for resilient performance (Hollnagel, 2010). However, when this was raised in the focus group discussions there was a poor response. This meant that focus group discussions were not an effective source for generating the sorts of learning items associated with resilience engineering theory. In this case, the researcher turned to resilience engineering theory and expert opinion to develop appropriate learning survey items from a resilience engineering perspective. This suggests that in the future, resilience engineering theory can inform the shortfall for developing survey items.

The survey results provide further insights into resilient healthcare on the AMU. In phase one, the focus groups provided rich, detailed accounts of how nursing staff manage the complexity of their everyday clinical work. The survey results from phase two built on these accounts and demonstrate that nursing staff believe the AMU is most effective at responding and least effective at monitoring. Additionally, the results show that nursing staff believe the AMU is not uniformly effective at all responding activities. This suggests that the survey items captured intricacies of system performance in a way that the focus groups could not. There is a high level of face validity because the results fit the narrative of the focus group discussions. There is also high levels of internal consistency. This supports the value of data triangulation with qualitative and quantitative research methods for exploring resilient healthcare (Berg et al, 2018). It also shows that it is possible to use quantitative methods for exploring resilient healthcare that align with resilience engineering theory and do not reduce this complex, nuanced concept to simple numerical metrics.

However, there was only 0.43 between the highest ranking and the lowest ranking resilience ability. This is not a statistically significant result. Using the statistical values in isolation, it is not clear how much of a meaningful differentiation this allows between how well nursing staff thought the four resilience abilities are conducted on the ward. This could potentially be a limitation and is a common difficulty of studying improvement in clinical micro systems. However, the aim of the survey was primarily to allow the whole nursing population on the AMU to participate in the process and engage with quality improvement. The question of whether this justifies the resources required to develop and administer the survey could not have been determined a priori, given the

exploratory nature of the study. There is little understanding about how much this is related to this particular application of the process, or whether this is a limitation of the design of the process. For example, this might be a consequence of analysing the AMU from the perspective of the nursing staff. If this same process was applied to a different clinical setting or developed with a broader range of healthcare disciplines, perhaps there would be a more meaningful statistical result.

On the other hand, the survey was not designed to be taken out of context and provide a comprehensive analysis of organisational resilience on its own. It was designed to be part of a three-step process. It is instrumentally, not intrinsically, valuable. The intention was that it could support the next stage of discussion and reflection in the final phase of the analytical process (Chapter 6 – Phase Three). The intention was not to take the survey out of context and reduce the four abilities to numerical values. This was a limitation of so many of the previous attempts at analysing or measuring organisational resilience (See Chapter 2 Narrative Review– Discussion). It could be argued that it is possible to remove the survey from this process of analysing organisational resilience of a healthcare system and use the focus groups from phase one and then the reflection in phase three to analyse a healthcare system. However, the value of the survey was providing direction to the reflection in phase three (See 6.3, p.153). Given there is still so much that is unknown about the process, further testing is required for any refinement.

There are consistent differences in opinion between junior and senior nursing staff on the AMU. Junior nursing staff are consistently more sceptical of the AMU's ability to respond, monitor, learn or anticipate than the senior nursing staff (including the management team). This shows that different people have different experiences, and this highlights the importance of capturing the views of everyone in the nursing population. This supports the narrative in the focus group discussions, which suggested that the less experienced staff are more involved with responding activities, whereas the senior nursing staff are involved with monitoring and anticipating activities (from a system perspective). Perhaps it is difficult for juniors to know about the activities they are not regularly involved in them and so are unaware of how well they are done in practice or perhaps senior nursing staff have a more realistic understanding of what is achievable in the context of the wider healthcare system.

Exploring the correlations between the survey items provides insight into the complex relationships between the responding, monitoring, learning and anticipating activities. Alongside the findings from phase one, this provides further support to the theoretical proposal that the four resilience abilities are interrelated (Hollnagel, 2010; Hollnagel, 2015). The results show that responding, the most comprehensive of the four resilience abilities, is strongly associated with monitoring, learning and anticipating. Suggesting that for the system to respond well, it needs to monitor, learn and anticipate well. The survey results also show that the nursing staff do not think the AMU is uniformly effective at all responding activities, but that it is effective at responding to clinically unwell patients and not to mental health patients. Even within the same resilience ability, there are complex relationships between the different groups of activities.

On the other hand, monitoring has a much more direct relationship with anticipating. Other than suggest the resilience abilities are interrelated, Hollnagel does not provide much more detail about the relationship between them (Hollnagel et al 2006; Hollnagel, 2010). It is unclear what these relationships mean for the potential for resilient performance. For example, the survey results show that nursing staff think the AMU is least effective at monitoring and it is the only resilience ability to have such a direct association with another resilience ability (anticipating). There is little evidence in the literature of detailed explorations of the relationship between the four resilience abilities (Van der Beek & Schraagen, 2015), so it is unclear what this might mean. Conceptually, it makes sense that there is a more direct relationship between anticipating and monitoring than the other resilience abilities. However, resilience engineering theory suggests that there should be a balance between the four resilience abilities (Hollnagel, 2010). Perhaps the relationship between monitoring and anticipating is an indication that in its current form the system is not particularly resilient and there needs to be a better balance between the four resilience abilities.

Phase two showed it was feasible to generate survey items grounded in the views of healthcare staff, which explored everyday clinical work and provided useful insights for analysing resilient healthcare. The survey results provided insights into the differences between the perspectives junior and senior nursing staff. However, the survey results could not provide explanations why

this was the case. In phase three, the next steps are to find out about why the nursing staff feel this way and how they might consider improving the system.

5.5 Reflexivity

Developing the process for generating responding, monitoring, learning and anticipating questions was the most challenging element of this part of the research. The volume of data from the focus groups was overwhelming and it was difficult to cast aside elements of the discussion, because it included such valuable accounts of everyday clinical work. However, it was clear from the start that most of the data should be discarded and only the very core of the focus group discussion could be represented in the survey. The whole process was developed with replicability in mind, so documenting and taking notes at each step was necessary. The effective collaboration with the expert group in phase one was essential for question development, because they could corroborate what should be included in the survey. Their feedback was vital for ensuring the survey items were representative of focus group discussions, relevant to resilience engineering theory and accessible to nursing staff. This level of corroboration was only possible because of the trust developed during the research design and the collaboration in the focus groups.

Administering the survey was difficult because of the busy nature of the work on the AMU. The participants who completed the survey online were people who were most engaged at work and regularly read their work emails. Participants who completed surveys online did so within one week. However, this was only a small number of nursing population on the AMU. Most staff needed prompting to complete a paper survey. The demands of the clinical work on the AMU were such that if the researcher did not visit the ward regularly and prompt people to complete a survey daily, then there would have been a much lower response rate. This challenged the researcher's relationship with the gatekeepers of the AMU. The researcher was often on the unit in the evenings and several times the gatekeepers made sure that the researcher was not interrupting clinical work when asking people to complete surveys. The researcher's experience working on the AMU meant that he understood the best times to ask nursing assistants and the

best times to ask nursing staff to complete a survey. It was only the combination of persistence, local knowledge and pre-existing relationships with nursing staff and gatekeepers that allowed the researcher to support so many of the nursing population on the AMU to complete a survey.

Chapter 6 – Phase Three – Reflecting on Survey Results

Phase three explored the research question 'How can the results of applying the Resilience Analysis Grid inform quality improvement?' The aim of phase three was to support nursing staff to reflect on the survey results, identify potential system improvements on the AMU and compare these perspectives with the ward management team's current safety and quality priorities. This provided understanding about whether using a resilience engineering perspective to understand system performance focused attention on previously neglected areas. By supporting nursing staff to reflect on the survey results, further insights were gained into the complexity of resilient healthcare on the AMU.

6.1 Design

There were two parts to this qualitative study. For the first part, the researcher used semi-structured interviews and one group interview to facilitate the expert group (recruited in phase one) to reflect on the survey results and identify system level interventions to improve the potential for resilient system performance on the AMU. The researcher used thematic analysis to explore this interview data. For the second part, the researcher used a survey to ask the ward management team about their safety and quality priorities to compare their perspectives with the survey results and expert group's reflections.

6.2 Method

6.2.1 Participants

For the first part of the study, the participants were the expert group recruited in phase one. The intention was to use the same expert group participants throughout the three phases of the research design for continuity. However, there was high turnover of nursing staff between the three phases of the study. To ensure there remained adequate representation of the range of nursing roles of the AMU, the researcher recruited three additional staff nurses by approaching them and asking them to be part of the semi-structured interviews. In total, there were seven

participants for the semi structured interviews: one healthcare assistant, three staff nurses, two junior sisters and one deputy ward manager.

For the second part of the study, the participants were the deputy ward managers and ward managers on the AMU. Purposive sampling was used to recruit one ward manager and two deputy ward managers to complete a simple survey exploring their safety and quality priorities for the AMU.

6.2.2 Data Collection

There were four semi structured interviews with individual members of nursing staff which lasted between twenty and thirty minutes. An opportunity arose to simultaneously interview all three of the staff nurses and this group interview lasted fifty minutes. The researcher used a list of the survey items, grouped into responding, monitoring, learning and anticipating, in order of mean score (highest to lowest) as an interview topic guide (Appendix M, p.272). During the interviews, nursing staff were asked to read through the items, describe what they thought about the order, explain why they thought the surveys items were ordered in that way and identify ways that these activities could be improved. The researcher encouraged them to consider improvements from a systems perspective, rather than an individual perspective. The interviews were conducted in a coffee shop on the hospital grounds, before the participants started a night shift. All participants gave their consent to be recorded and the interviews were recorded on the researcher's phone.

The ward managers were extremely busy, and it was challenging to support them to complete a survey. The researcher used opportunities when the ward managers were less busy to ask them the survey questions. The survey asked the ward management team to list three safety and quality priorities for the AMU (Appendix N, p.274).

6.2.3 Data Analysis

The researcher conducted a descriptive analysis of the interview data. This was much less intensive than the thematic data analysis of the focus group data in phase one. The aims of this

descriptive analysis were to identify reasons nursing staff agreed with or were surprised by the survey results from phase two and capture any suggested interventions to improve system performance. The themes were examined at a semantic level, which focused on the explicit meaning of the discussion and was informed by Braun and Clarke's (2006) analysis framework.

The analysis started with data transcription and the researcher transcribed all the interview data using Tracy's (2012) transcription guidelines (Appendix C p.216). The researcher took notes during transcription to document any ideas about themes or relationships between participant's comments. Then, the researcher read all the transcripts together and made further notes about any overarching themes. Following this, the researcher read each transcript in more detail and gathered similar comments about survey items and system level interventions for improving resilient performance into groups. Each group was then examined to see how it related to the individual comments and the transcripts as a whole.

6.3 Findings

There was general agreement with the survey results, with only a few participants expressing surprise about the mean scores for some of the survey items. Most of the discussion in the interviews focused on the survey items with the highest and lowest mean scores. The participants talked about the responding items the most and there was correspondingly less discussion about monitoring, learning and anticipating survey items. The findings are split into perspectives on survey results, suggested interventions for improving potential for resilient performance and the ward management team's safety and quality priorities.

6.3.1 Perspectives on Survey Results

The discussion of the responding survey items focused on managing deteriorating patients and supporting mental health patients. These are the highest and lowest scoring survey items respectively. There are a range of reasons why nursing staff thought the AMU is effective at managing deteriorating patients (Table 6-1).

Table 6-1 Perspectives on why the AMU was effective at managing deteriorating patients

Role	Theme	Interview Extract
Staff Nurse	Many systems in place support staff to escalate deteriorating patients	*I think it's just reinforced. So much. Because of SBAR[1] … And to do it. To call CRT[2]. If they're NEWSing[3] above a five.*
Staff Nurse	Frequency of deterioration means staff are well versed in using the systems	*It's really rare. Where you get one shift. Where. You don't escalate anybody… So. Practicing a lot. That's probably. Why. It's done well.*
Junior Sister	The systems provide structure to support escalation	*Who just. No matter. The experience. Like. To actually have a little bit of a structure. So. They can recognise. That. Oh wait. Actually. Is this a problem? Before. They actually call people. Because.*
Junior Sister	Significant amount of resources in place to support effective escalation of deteriorating patients	*I think th. There's a huge amount of work. Done. With that. And the fact that. There's this. Huge. This. Team of. CRT and things. That's why. It's very. Very much. In everyone's faces. What you must do.*
Deputy Ward Manager	Parameters for escalating are clear	*I think we are pretty good at that … It gets kind of drummed. Into everybody. As soon as they start. Escalate as soon as you get to a five. You know.*
Healthcare Assistant	Systems provide effective instructions for escalating deteriorating patients	*How the thing. Is. Put in place. Like. When someone is NEWS scoring. And e noting[4] is telling you that someone is NEWS scoring. It's telling you what you need to do. That you need to escalate that patient to.*

Note. SBAR[1]: Situation Background Assessment Response – a tool used to structure verbal communication

CRT[2]: Clinical Response Team – a team of experienced intensive care trained nurses who support nursing staff in ward settings to manage deteriorating patients

NEWS[3]: National Early Warning Score – a track and trigger observation tool for deteriorating patients

E noting[4] – IT system for documenting a range of patient information

Nursing staff report they are frequently exposed to deteriorating patients and this means they are very familiar with the system responses, such as monitoring guidelines and escalation protocols. It also means they have a good understanding of when and how they need to adapt the way they use these system responses. For example, increasing the monitoring of a patient sooner than the NEWS suggests because of their previous clinical experiences. The nurses staff agree that the systems are useful because they provide clear instructions about what to do across a range of situations. There is a significant amount of system resources focused on managing deteriorating patients, such as the specialised clinical response teams (CRT). Nursing staff suggest that it is the combination of the regular exposure to deteriorating patients, frequency with which they use system responses, usefulness of these system responses and amount of system responses that

mean the AMU is effective at responding to deteriorating patients. Their comments suggest that this is the focus of the unit and an integral part of the identify of the AMU. This is a good example of how systems can be designed to support effective responding.

There was universal recognition that the low mean scores for supporting mental health patients represent the experiences of nursing staff. This is due to a lack of system support and some nurses point out how this contrasts with how they feel the AMU manages deteriorating patients (Table 6-2).

Table 6-2 Perspectives on why the AMU was not effective at supporting mental health patients

Role	Theme	Interview Extract
Staff Nurse	Lack of knowledge about mental health affected nurses' confidence	*I think it. Kind of. Reflects. What. Where people's confidence as well. Cos. They won't. Well. I know that I don't feel tha:t comfortable. That well. With mental health patients. Because. I don't know an awful lot about it.*
Staff Nurse	Lack of structure to support handover of mental health patients	*But. (2). I guess it's. How. Do you. Handover. Cos. We're so structured. With like. The folder. E noting. Medchart[1]. What they want to know. Probably isn't what. What they want to ask.*
Junior Sister	Lack of training about mental health affected nurses' confidence	*I'm not surprised … Because. We're not trained. Like. I think it's a shame actually. That. Like. In the nursing degree. We don't. Actually. Get any.* [mental health] *Training at all.*
Junior Sister	No structure to support the work of RMNS or specials	*There's not structure around what RMNs[2] and specials[3] should be doing.*
Junior Sister	Lack of understanding means nurses don't know what RMNs should be doing	*From my experiences of working as a mental health nurse. The perception of. People. Who have never worked as a mental health nurse. May. Never. Have been in the hospitals. Don't actually understand. What. A mental health.* [Nurse] *Does.*
Deputy Ward Manager	Considerable variability between individual RMNs	*It depends what RMN. Is on duty. Some of them are frickin amazing. And some of them are. Just. Unhelpful.*
Healthcare Assistant	Considerable variability between individual RMNs	*When they are sitting with a patient and the patient just. Suddenly. Just. Wants. To walk off or something like that. They take a step back. And. They want our nurses to go in. And deal with the patient*

Note. Mechart[1] – IT system for medication administration

RMN[2] – Registered Mental Health Nurse

Specials[3] – Individual nursing team member tasked with caring for one patient so that they can be observed closely, often because they are delirious or high risk of falls

Nursing staff agree that a lack of knowledge and training is a considerable barrier to supporting mental health patients. The nurses who trained in the UK did not receive any formal mental health training. The system response for (most) mental health patients is to get the specialist mental health team to assess the patient and to put RMNs in place to care for the patient one-to-one. The RMNs are employed by a private agency and the unit has to hire them out on a shift by shift basis each time a patient with mental health needs is admitted to the unit (as assessed by the mental health team). This system response lacks structure and there is considerable variability about how well RMNs work with patients. Nurses thought this lack of structure is a barrier to supporting mental health patients effectively. This negatively impacted communication with RMNs and even with mental health patients. Some of the senior nurses had trained outside of the UK and had received formal mental health training as part of their nursing education. They had a broader understanding of how healthcare professionals interact with their patients in mental health settings and understood that RMNs did not need to be continuously interact with their patients during a shift. This further demonstrates how the lack of mental health training limits the nurses' ability to support patients with mental health needs. The combination of no relevant formal training, little structure to guide work and variability between mental health professionals meant the nursing team are not confident in the AMU's ability to support mental health patients.

There was a mixed response to the effectiveness of communication between members of the nursing team (Table 6-3). Junior nursing staff thought there is effective communication and good team work between the nursing team, however senior nurses and healthcare assistants recognised there are ongoing problems on the unit with these elements of team working.

Table 6-3 Perspectives on Results for Communicating with Nursing Team Members

Role	Theme	Interview Extract
Staff Nurse	Unexpected low score for communicating between nursing team	*I'm surprised that this is so far down actually. The communicating with all members of nursing team about patient care during a shift.*

Staff Nurse	Understanding that healthcare assistants have a different perspective	*I think. That's. I was just going to say that a lot of healthcare assistants voted that lower.*
Junior Sister	Variability in team working from day to day	*I think there is a bit of variability. In how well that's done. Day to day.*
Junior Sister	Definition of team can change depending on who is included	*If you're including in your team. Your RMNs. And your specials. I don't think we do that particularly well. They're left out on a limb.*
Healthcare Assistant	Variability is due to which individuals are working each day	*Some days ... What was yesterday? It depends what team you have on. And. You just know what kind of day you're going to have.*

The senior nurses and healthcare assistant suggest that variability in the effectiveness of communication between members of the nursing team is due to the constantly changing individuals on each shift. Everyone worked in a certain way and when individuals combine into a nursing team on a shift, that team works in different ways. This highlights the complexity of team working in the dynamic environment on the AMU and the nursing staff suggest this directly influences the unit's potential for resilient performance.

The nursing staff agreed that the low mean scores for monitoring reflected their experiences working on the unit, but they also recognised the value of monitoring and suggest it is important for managing the challenges of their everyday clinical work (Table 6-4).

Table 6-4 Perspectives on the Challenges with Monitoring on the AMU

Role	Theme	Interview Extract
Staff Nurse	Physical layout of the AMU limited monitoring	*I think. In. Design of the ward. Doesn't favour. Kind of. Knowing. About other zones* [areas on the AMU]
Staff Nurse	More junior nursing team had reduced capacity for monitoring activities	*When. I. We. First started. And. I think. Back then. There was a lot. People. Were. The teamwork. Across. The floor was a lot better … Don't know whether that's been lost i:n. New starters. Just trying to really focus on. Getting their. Skills-*
Staff Nurse	Variability of nursing teams limited monitoring	*I think it depends on how strong your team is as well. Like. A full zone. When you've got a crap team. Then you can't really. Go and help zone one.*

Junior Sister	The nurse in charge is responsible for monitoring functions on the unit	*There are some people that are very initiative and proactive. And that's fine. But. Normally. I would say. It's the nurse in charges. Role. In each zone. To be like. Oh. I recognise this. And. I need to call this person now.*
Deputy Ward Manager	High patient acuity on the AMU limited capacity for monitoring	*I don't think we are. It's just because of. Sometimes. The acuity of the ward. You get so engrossed in your own job. And your own work. That you're like. Kind of. Screw everyone else. I'm already sinking here.*
Healthcare Assistant	Healthcare assistants often had much better understanding status of the work across different zones than nursing staff	*I always touch base. It doesn't matter where I am working. In my zone. I went to [another healthcare assistant] and I was like. Are you alright? Do you need any help with your washes?*

Monitoring the status of the nursing work during a shift is a complex skill, which involves a nuanced understanding of the individual capabilities of the nursing team on each shift and the workload across the unit. Junior nursing staff tend to only have the capacity to manage their own workloads. So, only experienced nurses have the capacity to do the monitoring activities well. Many thought that it is the nurses in the coordinating roles (NIC and coordinator) that should be doing the monitoring activities because their role requires them to have a good understanding of the workload across the AMU. However, there is little system support or adequate time for monitoring in these coordinating roles and this means that monitoring functions rely on individual expertise. Consequently, there is considerable variability in how well these are carried out.

The NICs and coordinators often need to provide closer support to individual nurses in their team for a range of reasons, such as the high number of newly qualified staff, unexpectedly high workload, unusually complex workload or insufficient staffing levels. When this is the case, there is no one else to do these monitoring activities. The experienced nurses talk about coming to the end of their shift and having no understanding of the workload of other zones on the unit. In contrast to this, the healthcare assistant reported they often move between different parts of the unit to help other healthcare assistants (or nurses) much more often than the nurses do. In doing so, they have a much better understanding of the workload across the whole unit than the staff nurses do and this was not widely understood.

The nursing staff recognise that learning is limited on the unit (Table 6-5). They felt that only the learning from significant adverse events is regularly communicated.

Table 6-5 Perspectives on the challenges with Learning on the AMU

Role	Theme	Interview Extract
Staff Nurse	Learning from things that went wrong is repetitive	*I think. Because it's so repetitive. As well. You just zone out… The first time you hear it. It's like. Oh it's different. Yay! And then for the next three months. You're like.*
Staff Nurse	Positive feedback was the only mechanism for learning from things that went well	*I think sometimes. They can be good with feedback. Like. With the end of life stuff. We're usually good at. Picking up things. And using good examples of stuff.*
Junior Sister	Staff were frustrated at the lack of transparency with the learning process.	*You don't actually get told. This is why. This has gone wrong. And this is what happened. And this is why this is a better way of doing it. We don't go through that at all. Um. And maybe. Like. The. Deputies and the ward sisters do. Because. They are the ones that review the datixs. But we. As the staff. Don't.*
Junior Sister	Learning was limited due to high turnover of junior staff	*They have such a huge turnover of staff. They do all this learning. If you went to. Any of the newly qualifieds. That have just started. And asked them. About. Falls. And curtains. And can you remember that. On the big four. They'll say no.*
Deputy Ward Manager	Senior nursing staff involved in the learning process had a different perspective	*I think. Well. We try to do lots of learning. From. Especially in the big four[1]. For the datixs.*
Healthcare Assistant	Nursing staff only hear about learning when it's from things that have gone wrong	*Whenever an incident happens. Unless it's serious. And they come to you. And say. A series incident has happened. It's on the big four. Before that. I'm sure they've got lots of these datixs. But you don't get nothing. From it*

Note. 'Big Four'[1] - strategy used by the hospital to highlight safety issues. At the beginning of each shift (the only time that all members of the nursing team for the shift were in one place) the coordinator read out four key messages about safety and quality concerns (selected by ward managers).

Many nurses said they only receive the outcome of the investigations into adverse events and that this is very always helpful for understanding what went wrong. Some nurses expressed interest in having more information about the investigation process. They also expressed that the learning mechanisms on the unit are static because the 'Big Four' remains unchanged for long periods of time. One of the senior nurses suggested the high turnover of junior nursing staff limits the amount of learning that can happen on the unit. They talked about lessons that had be shared

from a series of inpatient falls and how none of the current junior nursing team worked on the unit when this happened. This highlights how the high turnover of junior nursing staff affects responding, monitoring, learning and anticipating and ultimately the potential for resilient performance. The nurses talk about positive feedback as the only mechanism for learning from things that go well. However, this is about recognising when an individual had done something well and giving them praise. It is not embedded at a system level and happens sporadically.

There were only three anticipating items in the survey and this resilience attribute had the least amount of discussion. The nurses were unsurprised that the survey results suggest the unit ix more effective at identifying when the workload on the next shift will be so high, than being able to reduce it (Table 6-6).

Table 6-6 Perspectives on the Challenges with Anticipating on the AMU

Role	Theme	Interview Extract
Staff Nurse	Limited ability to reduce workload for next shift	*. I think. Recognising that the next shift is going to be hard. But your shift is already heavy. Of course. There's only a limited effect that you can have.*
Staff Nurse	There are tasks you can do to reduce workload for next shift	*One double handed. Because. You are going to change. And reposition your patient. Around six. Seven eight. Anyway.*
Junior Sister	There are some things that you can do for the next shift that are more useful than others	*My first thought. Was. Oh. We are a nurse short. But. Not that I always action it. Oh. Ok. We should really start. We should do some meds. Where am I allocating that nurse in charge? Let's do some meds. To take the pressure off.*
Junior Sister	Senior staff do more anticipating work	*My personal experience. I will definitely. Always. Look at the staffing for the next shift.*
Deputy Ward Manager	Senior staff are good at anticipating	*I think we're really good at that. Because. Everyone is always like. Oh. You can't put that patient in that bay. Because it is too heavy.*

There was overall agreement that the unit is effective at identifying when the workload on the next shift will be high. However, the junior nursing staff thought that the unit does not do this well, whereas the senior staff thought that the unit does this effectively. The anticipating activities are done by experienced nurses in coordinating roles. Senior nurses listed several specific activities that are effective for helping to reduce the workload for the next shift. It was clear that are no

systems in place to support nurses to carry out these anticipating activities and consequently there is variability between how well these are done each shift.

6.3.2 Suggested Interventions for Improvement

Nursing staff identified interventions for improving the AMU's ability to respond, monitor, learn and anticipate. They had a range of suggestions that include training, changing the way of working and employing unused system resources. The researcher needed to direct the participants to focus on system level interventions, rather than focusing on individual activity.

Nursing staff had a series of suggestions for improving the systems for supporting mental health patients on the AMU (Table 6-7).

Table 6-7 Suggested Interventions to Improve Care for Patients with Mental Health Conditions on the AMU

Role	Theme	Interview Extract
Staff Nurse	More education about legislation to support staff with mental health patients	*I think it's probably. Just a case of. Making people more aware. Like. What is a sec. What is a section two under the mental health act? What is a five two? What. Does. Where does that?*
Staff Nurse	More education for specific mental health conditions	*What. Some of the basic psych conditions are. Like. How you treat paranoid schizophrenia? What. What are the symptoms of that?*
Staff Nurse	More training to support working with RMNs[1]	*Our expectation is that. You are a registered nurse. You will do the patient's observation. You'll check in with the nurse. And not wait for them to check in on you.*
Junior Sister	Improve the systems to support communication between nursing team and psychiatric liaison team	*Because a lot of the time. You won't have a clue. If you're lucky. They've told you what the plan is. If not. It. Always requires you calling them to say. You haven't put it on. Even that. Or. We should have access to their system. To see what they've written*
Junior Sister	Spend some time working in a mental health setting	*Spend more time. Like. At. We should spend time. On a mental health ward. Or. With RMNs. And. Actually like. Spend a day. With. A mental health nurse. In a psych unit. And see what they. How they approach certain things.*

Deputy Ward Manager	Involve RMNs in nursing team handovers	*They need to be more involved in our handovers. The whole nursing team handover. So then. They're. I suppose. That. General medical staff. And can understand. What it is. They do handover. And what it is they're looking for.*

The nurses talked about lack of knowledge and training as a barrier to supporting mental health patients. Consequently, many of their suggested interventions involve training for supporting mental health patients on the AMU. This ranges from local training about specific conditions regularly seen on the unit, to more global changes to the way nurses are educated. Many nurses were in favour of introducing more structure for the interaction between nursing staff, RMNs and mental health patients. Some of these suggested interventions were a clearer handover structure and guidelines to clarify what is expected of the RMN and the nursing team when supporting a mental health patient. There were also more global suggestions that are beyond the scope of local quality improvement strategies, however the nursing team thought that these are necessary for improving the systems to support mental health patients. For instance, one of the nurses thought working in a mental health setting would be beneficial because the nursing team could gain more experience working with mental health patients.

Many of the nursing staff agreed that monitoring is important for managing their everyday clinical work more effectively and had suggestions for how this could be improved (Table 6-8).

Table 6-8 Suggested Interventions for Improving Monitoring on the AMU

Role	Theme	Interview Extract
Staff Nurse	Huddles between the nurses in charge and coordinator	*Just between the nurses in charge. And be like. Look. This is what is going on. Because I think this links back to. The supporting staff to develop new skills. Because. It is a skill to be like. Looking out. And be like. I can recognise they are struggling.*
Junior Sister	Huddles between the nurses in charge and coordinator	*Because you get in a bubble. And there's no communication. I think. I've said this before to you. I think that. Can change. By. Yes. You. We have these team. Zone huddles. But. If the nurses in charge all got together … It only needs to be two minutes.*
Staff Nurse	Clearer criteria for appropriate admissions onto	*It could be stuff like. You know. Like. When they. Um. For DKA. If their ketones are still above seven or unreadable. They are not safe to go on the ward. They need to be. In*

	the AMU from the Emergency Department	*a critical care setting. Or improve before they come round. (2). They could do more stuff like that. That. People still don't. Ask. On the phone. If you don't ask. They are going to come round.*

Some of the suggested changes are about improving communication between the nursing team on the unit and moving away from relying on individuals. Several nurses suggested introducing a new way of working where the nurses-in-charge and coordinators meet more regularly during a clinical shift to facilitate regular conversation and improve the shared understanding of the workload across the unit. Other suggestions involved bringing in more resources from other parts of the hospital to improve the process of transferring patients to other inpatient wards from the AMU. For example, one nurse suggested using a senior nursing role, such as a matron, from the other inpatient wards to assist with telephone handovers. One of the major barriers to communicating with the other wards is the poor telephone communication between them. By having a single point of contact to facilitate the telephone handovers to other wards, they thought this process could be improved.

The nursing staff were frustrated at the lack of learning on the unit and had suggestions for improving this, including improving existing learning structures and introducing new learning structures (Table 6-9).

Table 6-9 Suggested Interventions for Improving Learning on the AMU

Role	Theme	Interview Extract
Staff Nurse	Use the big four as a platform for learning what goes right	*Find what's gone wrong. Definitely. But find. Something. That was actually a good example of. When it went right.*
Junior Sister	Share the investigation process more clearly	*An email being like. Oh. By the way. We had this datix. This is what. How it happened. This. This is how we understand this took place. And this is why it needs to change. And we've suggested this. And have you got any other suggestions?*
Deputy Ward Manager	Involve more of the junior nursing staff in the investigation process	*Maybe. They need to come and spend. Maybe. Like. A random. Day. With management. Watch us sit there on the computers. And. Do all the datixs. And RCAs.*

Healthcare Assistant	Share suggestions for improvement between the nursing team more regularly	*And if anyone knows any more suggestions to make. To how to make this place better. Or to work well. Bring it out.*

Nursing staff suggested that the 'Big Four' could be used to share lessons from what goes right as well as what goes wrong. They thought that they would be able to learn as much from good examples of practice as they could from poor examples of practice. The healthcare assistant felt that this mechanism could be changed to include a discussion and opportunity to share suggestions for improvement between members of the nursing team. Some suggested that more of the investigation process should be shared, rather than just the outcomes, because this would be helpful for their learning. The deputy unit manager took this further and suggested that more junior members of staff could be involved in the process, so junior nurses understood it better.

6.3.3 Ward Managers' Perspectives

The deputy ward managers and ward managers' safety and quality concerns were balanced between short-term and long-term system demands (Table 6-10). Short-term system demands were immediate concerns about the safety and quality of system performance on a day-to-day basis. Long-term system demands were concerns about how to ensure the AMU could continue to provide safe and quality care in the future. There were mainly orientated towards staffing issues.

Table 6-10 Ward Managers' Safety and Quality Priorities

Scope of concern	Concern
Short-Term	Ensuring there are enough nursing staff on each shift
Short-Term	Ensuring that there is an appropriate skill mix of nursing staff on each shift
Long-Term	Maintaining training and develop needs of nursing team
Long-Term	Supporting development of newly qualified nursing staff
Long-Term	Recruiting new nursing staff
Long-Term	Retaining existing nursing staff
Long-Term	Adverse event investigations

The short-term demands needed to be addressed before long-term demands. For example, much of the ward managers' time is spent making changes to the staffing rota for the next few days in

response to staff illness or inappropriate skill mix. Sometimes other demands, such as unexpectedly high patient acuity on the unit mean the ward management team need to provide more direct support to nursing staff. Only once these short-term demands are resolved, could the ward managers attempt to address the long-term demands. They have to constantly balance these different demands.

6.4 Discussion

Phase three explored the research question 'How can the results of applying the Resilience Analysis Grid inform quality improvement?'. The aim of phase three was to support nursing staff to reflect on the survey results, identify potential system improvements on the AMU and compare these perspectives with the ward management team's current safety and quality priorities. The findings demonstrate that it was feasible to support nurses to reflect on the results and they could identify system level interventions, with the appropriate support. However, these suggestions were high-level and underspecified meaning they cannot be taken forward without further development. The nurses could explain why some system activities on the AMU are done well and why some are much less effective. This provided further insights into understanding resilient healthcare performance on the AMU and shows that the findings from phase three effectively built on the findings from phase one and two. The nurses suggested system level interventions, which are different from the quality and safety concerns of the management team on the AMU. However, it was not clear whether the insights gained from applying the three-stage process for analysing organisational resilience added anything beyond pre-existing approaches for understanding performance in complex sociotechnical systems.

Nursing staff were engaged with the research problem and provided detailed insights into the survey results. The findings demonstrate the value of involving the nursing staff in this process, as the experts of their system only they have the specific, detailed knowledge of how their system works. Without involving them in this way, it would not have been possible to reach this level of understanding. They could suggest interventions to improve the AMU's systems, which are informed by a nuanced understanding of the intricacies of everyday clinical work. However, they

needed guidance to focus on system level interventions rather than individual level interventions and ensure the interventions were informed by resilience engineering theory. This suggests it is necessary to include researchers with sufficient knowledge of resilience engineering to make the most of these nuanced insights.

However, the suggested interventions for improvement were high-level and underspecified. They require further elaboration and testing to inform interventions for improving the AMU's ability to respond, monitor, learn and anticipate. The findings showed that it is possible to support healthcare staff to move from analysing organisational resilience to identifying ways to improve it. However, it was not clear the extent to which these suggestions could improve the organisational resilience of the AMU because this was beyond the scope of the study. Nor was it clear how specific to the resilience engineering theoretical lens these quality improvement suggestions were. Other approaches, such as Hierarchical Task Analysis (Stanton, 2006), may have been able to identify similar suggestions for quality improvement and have already been used in healthcare (Lane et al, 2006). Further applications of this process and exploration into developing interventions are necessary to understand what this process and the resilience engineering theoretical lens can add beyond pre-existing approaches for understanding and improving quality and safety issues in healthcare.

The nurses provided valuable insights into why the AMU is effective at some responding activities, but not others. According to the nursing team, the unit is effective at responding to deteriorating patients because of the frequency they are exposed to these scenarios, intimate knowledge of relevant guidelines and the amount of system resources dedicated to this. This is a good example of how a system can effectively support nursing staff to manage the complexity of their nursing work. In direct contrast to this, the nursing team suggest that the unit is ineffective at supporting mental health patients because there is an absence of system level support. Consequently, these activities rely on individual practices and this leads to unwanted variability for how well they are carried out. Nurses supported the view that developing system level interventions could reduce this unwanted variability from relying on individuals to fulfil system level functions and provide support to manage the complexity of their everyday clinical work. The granularity of the survey items meant that it was relatively straight forward to identify ways to improve the system because

they represented specific activities on the unit. Without this, identifying ways to improve the healthcare system may have required more detailed investigation. The extent to which the AMU, in its current format, relied on experienced nursing staff to fulfil system level functioning limits its potential for organisational resilience. The relationship between individual and system performance is not well explained by resilient healthcare theory. The reliance on individual performance for these system functions suggests that monitoring and anticipating are underdeveloped at a system level and there is space to develop these further. There is considerable agreement that involving healthcare staff in quality improvement is a useful endeavour (Dixon-Woods et al, 2012), so this is not a novel finding for this study or a resilience engineering lens of understanding. However, it does show how and why involving healthcare professionals in exploring the Work-As-Done in a healthcare system is useful. This should be more widely recognised in the resilience engineering literature.

The nursing staff had good suggestions for improving the systems to support the way they manage the challenges of their everyday clinical work and these were different to the quality and safety concerns identified by the ward managers. The ward managers had to prioritise immediate staffing issues to ensure that the unit could function appropriately. This is a result of wider system pressures, such as ensuring the AMU is functioning sufficiently to respond to the flow of patients from the ED. The interview with one of the deputy ward managers suggested that the managers are aware of some of the issues raised by nursing staff in the semi-structured interviews, but the immediate demands of their daily work means they are unable to focus on them.

This process demonstrated that it is possible to move from analysing the current state of a healthcare system, to begin to identifying ways to improve it. Nurses supported the view that developing system level interventions could reduce unwanted variability from relying on individuals to fulfil system level functions and provide support to manage the complexity of their everyday clinical work. The granularity of the survey items meant that it was relatively straight forward to identify ways to improve the system because they represented specific activities on the unit.

6.5 Reflexivity

The interviews with nurses in phase three benefited from the trust, collaboration and corroboration with the expert group in the previous stages of the research design. These were open and honest conversations about the survey results, the work on the AMU and ways to improve it. The researcher provided much less direction in these interviews than the focus groups in phase one because by this stage in the study, the expert group members felt empowered to reflect on the survey results and identify improvements for the AMU systems. This final phase was about working together with nursing staff to identify ways to improve the healthcare system. The nurses identified several interventions that the researcher had not considered, which provided further support for engaging healthcare professionals in the analysis and improvement of their healthcare system.

It was challenging to engage with the ward managers to get their perspectives about their quality and safety priorities for the unit. They were willing to participate, however finding the necessary time and space to talk to them was difficult. Initially the researcher emailed them an online version of the survey, however after two weeks there were no replies. Then he handed the ward managers paper copies, but as soon as the ward managers put these down they were forgotten about. Their role is extremely challenging and involves constant problem solving for both short-term and long-term challenges. Eventually, the researcher resorted to reading the questions out loud when the ward managers had ten minutes to spare during the day. This was the only way, in the time limits of the thesis, to capture their perspectives. They are the experts of the system and the most experience nurses on the AMU so their views are valuable for understanding the nuances of system performance on the AMU.

When answering questions, it was clear the ward managers were thinking about particular challenges relevant to that clinical shift or upcoming week and their reflections were heavily influenced by this. If the researcher asked them the same questions four weeks later, they would probably have different answers. There are such great demands on their time, that they often only have the capacity to manage short-term problems associated with the next few days. Ward

managers were aware of many of the issues raised in this process, for example the challenges with supporting mental health patients, however they did not have the capacity to devote as much attention to it as the nursing staff did in this research process.

Chapter 7 – Discussion

7.1 Summary of Findings

The RAG was proposed as a means to analyse organisational resilience, but at the time of writing there was little guidance available about how to apply it. In this study, the researcher developed and implemented a three-stage process for analysing how well a healthcare system can respond, monitor, learn and anticipate according to the views of the healthcare professionals working in the system. The findings of applying this three-stage process demonstrated that it could identify high-level interventions to improve the quality of care. However, these suggestions for quality improvement required further elaboration and testing. It is not yet clear what this process added to quality improvement beyond other pre-existing approaches. This is a novel approach for analysing and working towards improving the organisational resilience of healthcare systems. This study also provided a contribution to knowledge through the methodological and theoretical development of the resilience engineering field.

The primary research questions were:

How can the Resilience Analysis Grid be further developed to provide a replicable context specific process?

How can the views of healthcare staff be incorporated for analysing organisational resilience?

The secondary research questions were:

What is Work-As-Done for nurses?

How can nurses' Work-As-Done be understood in terms of the four resilience abilities?

How can the development of responding, monitoring, learning and anticipating survey items be informed by accounts of Work-As-Done?

How can the results of applying the Resilience Analysis Grid inform quality improvement?

This thesis answered the primary research questions through developing and implementing the three-stage reflective process for analysing the organisational resilience of healthcare systems. The process was replicable and systematic, with the intention that other researchers and healthcare professionals can use it to analyse and improve the organisational resilience of their healthcare systems. By starting with focus groups to explore the challenges of the everyday clinical work the data was grounded in the experiences of healthcare professionals and was therefore specific to their local context. Each stage of the multi-phase process built on the analysis of the previous stage and in an iterative manner each stage provided a different perspective for understanding system performance. The study used a social constructivist epistemology to design a participatory process, which effectively engaged nursing staff throughout and captured the complexities of everyday clinical work which is at the centre of resilient healthcare theory (Hollnagel et al, 2013; Wears et al 2015; Braithwaite et al, 2016).

Focus groups were an effective method for engaging healthcare professionals and exploring the nurses' Work-As-Done. Starting discussion with the challenges elements of the nurses' work and exploring the four resilience abilities together proved to be a useful way to analyse resilient system performance. The systematic process for generating survey items from the focus group data showed that it was possible to develop survey items, grounded in the views of healthcare professionals, which explored how well a system can respond, monitor, learn and anticipate. The final reflective element to the process in phase three showed that when supported effectively, nursing staff could identify a range of interventions which were different to the current safety and quality concerns of ward managers.

7.2 Organisational Resilience of the AMU

In its current form, the AMU is best at responding. Monitoring and anticipating activities are done by experienced individuals, with little system level support and therefore there is variability in how these activities are performed. There are no effective learning systems in place to support learning from things that go well and learning from adverse incidents is not rated very highly.

Responding activities dominated the nurses' everyday clinical work, had the highest number of survey items and the highest mean score of the four resilience abilities. There were many dimensions to responding activities on the AMU and it was important to examine the variability between them to fully understand the system's ability to respond. Survey results showed that nursing staff thought the AMU is only effective in responding to some, not all, problems. Nursing staff could identify why there is such discrepancy between responding activities and, when supported appropriately, could suggest interventions to improve system support for those that were weak.

It was particularly clear that nurses felt the AMU was poor at responding to patients with mental health problems. These findings supported the existing literature, which confirms healthcare staff in acute hospital settings lack training and knowledge for recognising and managing common mental health problems (Royal College of Psychiatrists, 2013). A review by the Royal College of Nursing found there was a lack of knowledge and skills, as well as polices and guidance for nurses in acute hospital settings (Ford, 2017; Royal College of Nursing, 2019). Yet, there is an increasing prevalence of mental health problems in acute hospitals (Naylor et al, 2016). This is only expected to get worse as patient admissions with mental health problems in acute hospital settings are set to increase (Naylor et al, 2016; Ford, 2017). This means that a process for exploring what is challenging about responding to mental health patients in acute hospital settings could provide valuable insights for improving healthcare systems.

Nursing staff thought the AMU is least effective at monitoring and had the lowest mean score of the four resilience abilities. Nursing staff confirmed that most of the monitoring activities relied on

experienced nurses and consequently there is significant variability between how well these activities are carried out day to day. They recognised that relying on individuals to fulfil system level functions results in unwanted variability and consequently many of their suggestions focus on system level support for monitoring activities. This demonstrates that the three-stage process is effective at recognising the weaker resilience abilities and identifying ways to improve them.

Learning was the most challenging resilience ability to analyse on the AMU. Any discussion of learning activities focused on learning from things that go wrong. As a result, the researcher needed to generate learning survey items from resilience engineering theory, rather than grounded in the experiences of nursing staff. Much of the improvements suggested by nursing staff were about improving their involvement in learning processes. Current systems for learning from adverse incidents occur in other areas of the hospital and are undertaken by staff from other areas. This suggests that improving learning both from adverse incidents and positive outcomes should be a priority. On a positive note, the thematic analysis from the focus groups in phase one suggested that the focus groups themselves provided a space for learning from things that went right as the nursing staff shared their adaptations. Focus groups are known to be an effective approach to support learning. This fits with other research about informal mechanisms for learning (Sujan, 2015). There is also well-established research about communities of practice and how they support organisational learning (Lave & Wenger, 1991; Weneger & Snyder, 2002). They are known to be effective for sharing tacit knowledge and have been used in healthcare as a tool to improve clinical practice (Ranmuthugala et al, 2011). This literature supports the findings from the study. It emphasises the importance of developing time and space within healthcare systems to support healthcare to come together and reflect on their work. The process developed in this study provided structure to do this in a busy, acute hospital setting.

Anticipating had the least amount of discussion. Focus group discussions in phase one focused on responding and monitoring activities. Since it had the least amount of discussion, anticipating had the fewest survey items of the four resilience abilities. Nursing staff suggested that anticipating is like monitoring, in that anticipating activities rely on experienced individuals to do them and consequently there is unwanted variability between how well these are done each shift.

The experienced nursing staff could identify effective activities for reducing the workload for the next shift, but this is not shared with the wider nursing team.

The resilience engineering literature suggests that there should be a balance between the four abilities, however this is not prescriptive and recognises that the balance will be different for each complex system (Hollnagel et al 2006; Hollnagel, 2010; Berg et al, 2018). To improve its potential for resilient performance, the AMU should address the imbalance between responding, monitoring, learning and anticipating activities. The findings from the thesis suggest that some starting points would be introducing systems for learning from things that go well (the focus groups appeared to be an effective solution) and introducing system level support for monitoring and anticipating activities.

This is the first study to use this three-stage process to analyse a healthcare system and demonstrates that the RAG can also inform quality improvement. It shows that nursing staff, when supported by researchers with sufficient knowledge of resilience engineering theory, could identify system level interventions to improve responding, monitoring, learning and anticipating activities. However, since implementing these interventions is beyond the scope of the thesis, it is unclear whether and how these interventions may affect system performance.

7.3 Advancing the Resilience Analysis Grid

One of the main contributions of the study is a systematic and replicable process for analysing and improving organisational resilience in healthcare systems. This represents a significant advancement to the RAG. The narrative review at the beginning of the thesis showed that a process for implementing the RAG had not been developed, limiting the usefulness of the proposed theory (see Resilience Analysis Grid, p.47). Although Hollnagel provides some theoretical questions as a basis for developing the RAG (Appendix A, p.210), it was not clear how to adapt them to specific systems (Hollnagel, 2010). Previous applications of the RAG have used different approaches for modifying the original theoretical questions (Van der Beek & Schraagen, 2015; Chuang, 2015; Hunte, 2016; Engvall et al, 2017) but show limited success at capturing

questions specific to the system being analysed. The questions remained very abstract and theoretical rather than reflecting everyday clinical work (Hunte, 2016; Engvall et al, 2017).

The thematic analysis of focus group data in phase one showed that the four resilience abilities are interrelated and occur simultaneously (see Discussion, p.119). This supports the theoretical claims about the complex relationships between the four resilience abilities (Hollnagel, 2010; Hollnagel, 2015). So, studying the four abilities in healthcare should start with everyday clinical work because this effectively represents how the work is done (Hollnagel et al, 2013). This suggests it would be methodologically ineffective to begin analysing resilient healthcare by separating the four resilience abilities because this would not represent the work as it is done. Previous applications of the RAG in healthcare have used the original questions as a starting point (Chuang, 2015; Hunte, 2016; Engvall et al, 2017) and therefore may not have comprehensively captured everyday clinical work. Future attempts at using the RAG or the four abilities should begin by studying everyday clinical work and recognising the interrelated nature of the four resilience abilities.

Generating survey items directly informed by everyday clinical work was effective for analysing organisational resilience but can result in an imbalance between the number of survey items for each of the resilience abilities. Consequently, there may be a disproportionate analysis in terms of the number of items applied to each of the four resilience abilities. From a research design and quantitative data analysis perspective, this may limit the statistical methods that are appropriate for exploring the data (DeVellis, 2016). However, in line with resilience engineering theory, it is more important to have an exploratory qualitative analysis than inferential statistical analysis or psychometric testing. The quantitative elements of the process in this thesis demonstrated that descriptive statistical analysis can be useful for gaining an insight into system performance that qualitative data analysis cannot provide. However, any further statistical analyses risks lapsing into a reductive examination of system performance which fails to align with the core values of resilient healthcare theory, as shown in the findings of the narrative review at the beginning of the thesis (see 2.5 Discussion, p.73).

The number of survey items generated for each of the four resilience abilities is itself part of the analysis of the system's potential for resilient performance. This highlights the strength of this process as a diagnostic tool and is the first-time survey items have been generated in this way. Hollnagel suggests plotting the results of a RAG analysis on radar star plots to facilitate comparison between applications of surveys over time (see Resilience Analysis Grid, p.47) (Hollnagel, 2010). However, the uneven number of survey items and likelihood that the survey items would change over time means this is not useful for presenting the results of three-stage process developed in this thesis. The effective engagement with healthcare professionals throughout this process suggests there needs to be a way of feeding the results of this process back to the healthcare professionals involved. Perhaps there should be two levels of feeding back, one level to the nursing staff on the AMU and another level to the ward management team who can effect change on the unit. There are several ways this could be done but starting with specific interventions or discrete problems is probably the most helpful.

Relying on discussion with healthcare professionals to generate survey items meant that when discussion could not capture relevant theoretical elements, the researcher needed to develop them. This was most clear in the initial focus groups where nurses were unable to articulate learning experiences relevant to resilient healthcare (from things that go right) because they were constrained by current practices (see Learning From Each Other, p.115). Rather than have no learning questions, the researcher turned to resilience engineering theory to develop appropriate learning questions because learning is central to theoretical underpinning of the RAG (Hollnagel, 2010). This means the learning survey items did not capture everyday clinical work in the same way as survey items for the other resilience abilities. Despite this, nursing staff could still identify potential interventions, informed by resilience engineering theory, to improve the learning systems on the AMU (see Suggested Interventions for Improvement, p.161). So, bridging any gaps in discussion about everyday clinical work with theoretical perspectives was effective because healthcare professionals could still engage with the results in a useful way.

Hollnagel suggests using the RAG should be an ongoing process and the questions should be repeated over time to analyse how a system improves or changes (Hollnagel, 2010; Hollnagel, 2015). However, beyond this there is little direction about how long there should be between

repeated applications or what should trigger this repeated application. For the process developed in this thesis, there appeared to be two ways for repeating it over time. One option would be to repeat the survey questions following the implementation of interventions to assess whether resilience improved. A second option could be to repeat the wider three-stage process for generating new questions and focus on new responding, monitoring, learning and anticipating activities. Perhaps a third option could be something between these two, with a few focus groups to discuss updating the questions.

In phase three there was an explicit move from analysing organisational resilience to improving organisational resilience. It was clear that the suggestions for improvement were some way from being ready for implementation. There is already research on the challenges associated with quality improvement in healthcare (Dixon-Woods et al, 2012; The Health Foundation, 2018). Many of these challenges are related to sustaining quality improvement initiatives. If this process is to be effective at informing quality improvement initiatives, then some thought needs to be given to how improvement can be sustained (Dixon-Woods et al, 2012; Anderson et al, 2016). Involving healthcare professionals and paying close attention to local contexts are key for effective improvement initiatives (The Health Foundation, 2018). However, a significant barrier to quality improvement is the lack of expertise in local healthcare systems (Dixon-Woods et al, 2012; The Health Foundation, 2018). Further elaboration, testing and evaluation of this process is necessary to understand how it can effectively inform quality improvement and make use of what is already known in the literature about this.

7.4 Methodological Implications for Resilience Engineering

The main methodological contribution of the thesis to the resilience engineering field is a systematic, replicable process for using the RAG to analyse the organisational resilience of a healthcare system. As well, explore how the RAG could inform quality improvement. There was strong engagement from the expert group, confirming the importance of a participatory approach. With appropriate facilitation, the nursing staff could effectively identify system level interventions informed by resilience engineering theory. Specifically, the nurses agreed that developing a more

comprehensive system of support could reduce reliance on individual performance and reduce unwanted variability, without restricting their ability to adapt to the fluctuating circumstances of everyday clinical work (Suggested Interventions for Improvement, p.161). The survey items represented discrete activities on the AMU and this meant the nursing staff found it straightforward to focus on specific activities and suggest ways they could be improved. This was an effective way for including frontline healthcare professionals in improving their healthcare system, especially considering some of the challenges associated with involving them in quality improvement (Dixon-Woods et al, 2012). Literature reviews suggest the resilience engineering field has not yet produced methods or tools for improving the potential for resilient performance (Berg et al, 2018; Patriarca et al, 2018). The development of a process for implementing the RAG addresses this gap.

The three-stage process developed in this thesis is an integrated process, using mixed methods and drawing on core aspects of resilient healthcare theory (Hollnagel et al, 2013; Wears et al, 2015; Braithwaite et al, 2016). It shows that a mixed method research design is effective for analysing the organisational resilience of a healthcare system according to the views of healthcare professionals working in the system. Each of the three stages built on the findings from the previous stage and provided different perspectives on the complexities of system performance. This answers the calls in the resilience engineering literature to combine qualitative and quantitative data analyses, to effectively understand the complexity of organisational resilience (Berg et al, 2018; Patriarca et al, 2018). Despite the effectiveness of the focus groups in exploring the nuances of Work-As-Done, they only provided one dimension for analysing the organisational resilience of a healthcare system. This dimension was important because it explored social interaction and learning, which are at the heart of resilience engineering theory. However, the complexity of system performance means that organisational resilience should be explored from several different dimensions (Berg et al 2018; Patriarca et al, 2018). The survey results in phase two and supported reflection in phase three provided insight into the system performance that could not have been achieved by further focus groups with more nurses or even other healthcare professionals.

One of the main challenges of using a systems perspective to understand safety in healthcare is deciding the scope of analysis. This thesis has a narrow scope, since it uses the perspectives of one healthcare discipline working on one unit. This narrow scope allows the study to reach deep, nuanced insights into the everyday clinical work of nursing staff on the AMU. However, the nurses' everyday clinical work is affected by system pressures beyond the AMU. For example, the Critical Response Team (CRT) is responsible for responding to deteriorating patients across several inpatient wards. The way they respond to deteriorating patients on the AMU changes when there are many patients deteriorating at the same time, across different wards and this affects the way nursing staff on the AMU respond to their patients. Although these organisational processes which cross the boundaries of the unit clearly affect the nurses' everyday clinical work, they were not explored in detail because of the limited scope of the thesis. Resilient healthcare theory recognises that micro, meso and macro system pressures affect every day clinical work (Berg et al, 2018). This systems perspective maintains that understanding adaptations should involve understanding the wider context of the work (Hollnagel et al, 2006). However, in practice it is not possible to explore every system pressure that affects adaptations used by healthcare staff. Therefore, using this theoretical perspective requires making pragmatic decisions about the scope of analysis. The implementation of this multi-stage process shows that it is possible to use this theoretical perspective to examine parts of system performance, for example on a specific ward, whilst recognising that wider system elements beyond the scope of analysis also affect system performance.

Many previous studies of resilient healthcare have been observational studies (Wears & Perry, 2006; Ross et al, 2014; Sujan et al, 2015; Back et al, 2017). In view of this, they have focused on the micro level of system performance because this is where resilient performance is most obvious (Berg et al, 2018). However, organisational resilience occurs simultaneously across micro, meso and macro levels. Study design necessarily involves trade-offs between breadth and depth of understanding. In this study deep understanding was prioritised and it would not have been possible to achieve this across the whole hospital or across several units. However, the three-stage process developed in this thesis could be effectively applied at micro, meso and macro levels.

Involving healthcare professionals was crucial to the study. Without the involvement of nursing staff, it would not have been possible to reach such detailed insights into the complexity of everyday clinical work on the AMU. Involving healthcare professionals helped generate relevant survey items and identify effective system level interventions for improving resilient performance. Previous applications of the RAG have involved healthcare professionals (Van der Beek & Schraagen, 2015; Hunte, 2016; Engvall et al, 2017), but not to the same extent they were involved in this thesis. So, future explorations of resilient healthcare should seek to effectively engage healthcare professionals in the research process because it is only through their involvement that deep insights can be reached to take full advantage of the resilient healthcare theoretical perspective. Researchers with sufficient understanding of resilient healthcare theory are also necessary to ensure that healthcare professionals can be effectively involved in this research process. This may limit the replicability of this process because it requires a researcher with sufficient understanding of resilience engineering theory, as well as effective engagement with healthcare professionals.

The AMU changed during the study. Most of the expert group left the AMU or were promoted to different nursing roles as the study progressed from stage one to stage three. This meant that by the time the study was complete, there had been considerable turnover of nursing staff and there may now be different problems than at the start of the study. Since this study involved both developing and implementing the three-stage process for analysing resilient healthcare, it took longer than it would take to just implement the three-stage process on its own. Perhaps this could reduce the risk of the healthcare system changing during the analysis. However, this is a more general challenge for using resilient healthcare theory. This theoretical perspective advocates reaching a deep understanding of healthcare systems to sufficiently comprehend its complexity and how healthcare staff manage this complexity. Reaching this deep understanding takes time. However, healthcare systems are in constant flux and this means they change over time (Vincent, 2010; Rouse & Serban, 2011). This is a methodological challenge for resilient healthcare and there is little discussion about this. This challenge further identifies the need to make pragmatic choices for using this theoretical lens in practice.

7.5 Theoretical Implications for Resilience Engineering

The CARe resilience model was useful for informing a high-level deductive analysis of activities for understanding resilient system performance. For example, it was effective for identifying that many of the nurses' adaptations involved re-aligning system capacity to effectively meet system demand (Anderson et al, 2016; Back et al, 2017). However, it was unable to inform a more granular understanding of these adaptations to explain how or why adaptations work. For this deeper level of understanding, it was necessary to use the four resilience abilities (Hollnagel, 2010; Hollnagel, 2015), which can explain why adaptations may or may not work in practice (Berg et al, 2018). The four resilience abilities focus on concrete activities that can be observed in practice. By understanding these concrete activities, it is possible to comprehend why particular activities are effective for enabling resilient performance. The CARe resilience model cannot reach this level of granularity, which was necessary for understanding resilient performance.

A consistent theme throughout this study was the extent to which the complexity of everyday clinical work is due to the central role of social interaction in nursing work. The findings from the thematic analysis of the focus group data, the survey results and interviews with nursing staff reflecting on survey results all provided compelling accounts that most of their work is about interacting with other people, both healthcare professionals and patients. This social interaction affects the work-arounds and trade-offs that the nurses use, as people behave in different ways. It informs decisions about which adaptations nurses use and how they use them. Adaptations cannot work without sufficient interaction with other healthcare professionals and patients. Resilience engineering theory recognises the social element of sociotechnical systems and the value of an individual's ability to adapt to the changing circumstances of their daily work (Hollnagel et al, 2006; Hollnagel et al, 2008; Nemeth et al, 2009). Observational studies of resilient healthcare also support this (Sujan et al, 2015; Back et al, 2017). However, resilience engineering theory does not acknowledge how central social interaction is to achieve clinical outcomes, and how it greatly increases the complexity of everyday clinical work. The results from this thesis suggest a much more central role for social interaction in theories of resilient healthcare than has been the case to date.

There is an ongoing tension between individual, team and system level performance. Throughout the study, the accounts from nursing staff suggested that individual performance affects both team and system performance. For example, experienced members of the nursing team often conducted monitoring and anticipating activities that directly affected how well the AMU managed patient flow on a particular shift. It is clear that resilience engineering theory is concerned with a system perspective for understanding the performance of complex sociotechnical systems (Hollnagel et al, 2006; Hollnagel et al, 2015). It also recognises that complex systems are made up of individuals and that the ability of individuals to adapt to the variability of everyday working conditions contributes to resilient system performance. However, it does not provide enough detail about the relationship between individual, team and system level performance. The findings from the thesis suggest that individual and team performance directly affects system performance. They are therefore relevant to resilience engineering theory for understanding performance of complex sociotechnical systems.

7.6 Limitations

So far, the thesis has focused on the strengths of the study and its contributions to resilience engineering theory. However, it is equally important to consider the limitations of the study since this process is at such an early stage of development. The main limitations were the findings restricted to a nursing population, the lack of evaluation, the limited findings on quality improvement and the lack of Patient and Public Involvement (PPI).

It should be recognised that the findings of the study were limited to a nursing population and therefore conclusions about the wider healthcare system cannot be drawn. The rationale for focusing on the nursing population on the AMU was provided in the methodology section of the thesis (3.2 Theoretical Underpinning p.77). However, the findings showed that much of the complexity of the everyday clinical work involves the interaction between different healthcare disciplines. This sort of cross-boundary interaction is known to be a source of complexity in sociotechnical systems (Woods, 2006; Hollnagel et al, 2015). However, given that the study only

explored this from a nursing perspective, it can be questioned how effective it was for exploring the organisational resilience on the AMU. This is an ongoing challenge for studying the complexity of successful performance in sociotechnical systems. It is necessary to draw some boundaries around the research phenomenon for the pragmatic purposes of data collection and analysis. The challenges of including just one healthcare discipline in this study were considerable and the researcher worked hard to gain such detailed insights from the nursing staff. Including more healthcare disciplines would introduce greater challenges. Further applications of this process should consider involving a wider range of healthcare disciplines. Conceptually, this is more aligned with the resilience engineering theoretical lens. However, this might mean having to trade-off between the breadth and depth of analysis. For example, rather than analysing the organisational resilience of a system, the focus may have to be on analysing a process. Further research is needed to better understand the challenges and limitations of applying this process.

There was a lack of evaluation embedded in this study. This limited the ability of the thesis to conclude about the effectives of the process to analyse or improve the organisational resilience of a healthcare system. A comprehensive evaluation of this three-stage process would require implementation of the suggested interventions for improvement and this was outside the scope of the study. This sort of evaluation was not appropriate given the early stage of development of the RAG. Aside from the effective engagement and positive comments from the nurses involved, there was no evidence for how useful this process was for analysing or improving organisational resilience. This is significant because the resilience engineering field has yet to establish an evidence base for its effectiveness. Further iterations of the process should include evaluative elements to develop an evidence base of effectiveness. This would eventually provide more evidence to justify using the resilience engineering theoretical lens in the future.

The quality improvement suggestions from the nursing staff in phase three were high-level and underspecified. It was clear that these suggestions needed further development before they could be used in practice. It was not clear whether this process could suggest interventions that would be any more effective than pre-existing approaches used for quality improvement, such as Hierarchical Task Analysis (Stanton, 2006) or Process Failure Mode Effects Analysis (Johnson & Khan, 2003). These pre-existing approaches have already been used in healthcare (Lane et al,

2006). The resilience engineering theoretical lens is still developing its maturity and evidence base for interventions. Further applications of this process and exploration into developing interventions needs to be done to understand what this process and the resilience engineering theoretical lens can add beyond other approaches for understanding and improving quality and safety issues in healthcare.

There was a lack of Public and Patient Involvement (PPI) in this study. PPI is recognised as a core element of healthcare research (National Institute for Health Research, 2014). However, this is not reflected in the resilience engineering literature. There is very little discussion about how PPI relates to exploring organisational resilience in healthcare systems. Understanding complex sociotechnical systems is a complex task and the driving force of resilience engineering theory is that other theoretical perspectives have not been able to fully explain how performance is successful in these types of systems (Hollnagel et al, 2006). It is not clear how PPI should be included in this. There are known challenges with involving non-experts in the research process (Oliver et al, 2019). At this early stage of development, it is unclear what involving patients or the public could add to these research endeavours (although this may very well be the reason for including them). Perhaps once the resilience engineering lens has undergone further methodological development it will be clearer how and where PPI should be involved in resilience engineering research endeavours.

7.7 Recommendations for Implementing the RAG

The findings from this thesis suggest that the three-stage process developed in this study for implementing the RAG is a useful process for analysing resilient healthcare and identifying interventions to improve responding, monitoring, learning and anticipating activities. It is especially informative when healthcare staff are effectively engaged throughout the process. They can identify problems and suggest solutions that are not currently captured by current safety and quality concerns. Healthcare staff can generate interventions which are specific to the local context, which move beyond the short-term immediate problem solving of current safety and quality priorities.

Below are some simplified guidelines for repeating this process in other healthcare settings:

1. Identify scope and intention of analysis, for example inpatient ward, senior management team, board of directors
2. Recruit expert group to represent the different roles and levels of experience of the people that work within the scope of analysis.
3. Hold focus groups to discuss everyday work. This discussion should focus on identifying what is challenging about the work, why it is challenging and how people manage the challenges.
4. Identify questions from focus group discussions. In the beginning, this should be about generating as many questions as possible. Read through the notes or transcripts from the focus group discussion and generate questions about important points. Then, once the questions have been generated, group them into similar categories to identify any overlap between them. The number of questions can be tailored to the breadth and depth of the intended analysis. For example, a quick analysis would involve a few questions about key responding, monitoring, learning and anticipating activities, whereas a more comprehensive analysis would involve more questions covering a broader range of these activities.
5. Edit questions so they represent the focus group discussion and are relevant to resilience engineering theory. The expert group should review the questions.
6. Administer the survey to the wider population within the scope of chosen analysis. Self-administered surveys are the simplest way to collect data. However, this should be adapted to fit local context and other survey designs could be as effective for capturing data from a population.
7. Analyse the survey results with simple descriptive statistics calculating the mean, standard deviation and range for each of the subscales. More advanced statistics, such as Cronbach's Alpha and Spearman's rank order correlation are useful for understanding more about the data, but the intention of the analysis should inform the level at which the data are explored.
8. Facilitate the expert group to reflect on the survey results and identify system level interventions, informed by resilience engineering theory.
9. Feedback the findings from this process to the expert group and the wider population who completed surveys. It is also a good idea to feed results back to those in a position to make changes to the system in the light of the findings.

In the initial focus groups, it was clear that the nurses did not normally have the time and space to discuss and reflect on the challenges of their everyday clinical work. Many of them commented on how valuable this process was for sharing experiences and learning from each other. The value of spending 45 minutes reflecting on the challenges of their clinical work was clear. Showing the value of this to the ward managers could support this process to become a regular part of nursing work and could support learning from things that go right at a systems level. However, during the study the researcher was not able to feedback to the ward managers or the research participants about the findings from the study. Perhaps this should be built into the process of implementing the RAG to increase the chances of this research having a positive effect on the organisational learning in healthcare systems. This does not pertain to just the AMU in this study, but to other healthcare contexts, where there should be similar value in staff discussing and reflecting on the challenges of their work.

Applying this process to other healthcare settings and populations may introduce further challenges. Throughout this discussion chapter it was clear that involving a wider range of healthcare professionals in this process could provide a more comprehensive analysis of organisational resilience. Different roles have different pressures and it would be challenging to find a time that all the different healthcare disciplines would find mutually accessible. One of the most helpful facilitators for engaging with the nursing population on the AMU was the ability to use the ward managers' offices for the focus groups. This meant that the nurses could participate in the research during their working hours in their working location. If such a location was not available in a different research location, then it would be harder to support healthcare staff to participate in the focus groups during their working hours. Asking healthcare staff to participate in research outside of their working hours or location introduces further barriers, such as travel costs.

7.8 Recommendations for Future Research

This is the first time this process has been used to analyse resilient healthcare. Consequently, many of the recommendations for future research stem from repeating this process, both in the

same setting and in different settings, in order to further explore its effectiveness for analysing and improving resilient healthcare.

A natural place to start would be to develop and implement the interventions suggested by nursing staff in the final phase of the thesis. Once these interventions have been implemented in practice, the survey could be repeated to explore if there are any changes to nurses' perceptions about how well the AMU can respond, monitor, learn and anticipate. Then it would be possible to compare the results from the initial survey application and explore any changes. Finally, once this has been completed, the process of generating survey items could be repeated so that new responding, monitoring, learning and anticipating activities could be analysed.

To explore the complexity of system performance on the AMU further, this process could be repeated with the other healthcare disciplines that work alongside nursing staff, such as doctors, pharmacists and social workers. It would be interesting to see what challenges they face in their everyday clinical work and how this relates to the nurses' challenges. Using a broader range of healthcare disciplines could create challenges for reaching the same depth of analysis reached in this thesis. Perhaps then, using a broad range of healthcare disciplines would be best suited for specific tasks, such as discharging patients home.

This process should also be used in other healthcare settings, for example different inpatient wards or outpatient clinics, as well as across the different micro, meso and macro levels of system performance. Applications of this three-stage process across different healthcare settings would allow for the comparison of different challenges. It would also allow for comparison between the survey questions of different healthcare systems to reach a higher level of understanding about how responding, monitoring, learning and anticipating manifest across different healthcare systems. These questions could be collected in a shared repository so that other researchers and healthcare professionals can see the questions used in other systems.

7.9 Reflexivity

Attia and Edge (2017) suggest reflexivity involves both prospective and retrospective reflexivity. The researcher explored the elements of prospective reflexivity in the earlier sections of the thesis. In this section, the researcher explores the retrospective reflexive elements from the study. Retrospective reflexivity is about understanding how the research journey has changed the researcher (Attia & Edge, 2017). The researcher experienced this research process as both researcher and clinician, therefore this research process has changed the researcher's practice for both elements of work. This was the first interaction the researcher has had with post graduate research. Consequently, this was the first time they experienced facilitating focus groups, transcribing focus group data, qualitative data analysis, survey design, quantitative data analysis and academic writing at a postgraduate level. Each time the researcher engaged with these research activities there was a steep learning curve.

This thesis was the first time the researcher had any involvement with resilience engineering theory. It took about six months to understand these complex theoretical components at a level that was necessary for doctoral research and this was essential for effective research design. For example, understanding the distinction between measuring and analysing organisational resilience had a significant impact on the way the researcher approached the research problem. The researcher was strongly motivated to move from these abstract theoretical concepts to concrete research activities. Developing a research design that could do this in a rigorous, systematic way is what took the most time.

Despite these challenges, the researcher now has an effective grasp on the core principles of resilience engineering theory and appreciates their value for understanding and improving the safety of healthcare systems. They strongly reflected the researcher's own experiences as a nurse working on the AMU. This was a significant motivation to engage the nursing staff on the AMU in this research process because resilient healthcare theory recognises the work that healthcare professionals do in maintaining the quality and safety of healthcare. This is not well recognised by the current healthcare safety paradigm. It was rewarding to see how much the

nursing staff engaged with the research project and many commented that no one talks about safety in this positive light. It was especially rewarding to see how much the healthcare assistants engaged in this process, because their voices are often not well represented. It was unclear how much the nurses were involved in the research process because of the pre-existing professional and social relationships with the researcher and how much because they were empowered by resilient healthcare theory. Regardless, the researcher will continue to use resilient healthcare theory for understanding and improving the safety and quality of healthcare systems beyond the end of this thesis.

As a clinician, the researcher is more aware of the adaptations they use to regularly manage their own everyday clinical work. They found that resilient healthcare provides a language to talk about their work and helps make sense of negative or unexpected outcomes in a way the researcher could not do before. The researcher uses these insights to teach nursing students and support newly qualified nurses to develop; for example, moving discussion from talking about how to send a particular referral on the electronic patient records system, to understanding how to make these system elements helpful for clinical practice. Talking about the distinction between Work-as-Imagined and Work-as-Done is particularly helpful when teaching nursing students about clinical work. For many of the students, a placement on the AMU is the first time they are exposed to such a complex system and many students struggle to understand how to manage this complexity. The distinction between Work-as-Imagined and Work-as-Done is helpful for them to balance their expectations of the clinical work with the reality of the clinical work.

Balancing research and clinical roles was challenging. In particular, working part-time shift work alongside the full-time thesis work was hard. It was only by maintaining a part-time role that the researcher was able to access the training and development benefits available to regular (as opposed to temporary) members of nursing staff on the AMU. The researcher had only been qualified for six months before starting the thesis and was keen to continue to develop as a newly qualified nurse. Working at weekends and night shifts often prevented the researcher from developing an effective routine for engaging with the research work. Despite these challenges, it was incredibly valuable and without these dual perspectives, it would not have been possible to reach the same depth of understanding of organisational resilience on the AMU.

7.10 Concluding Remarks

After four years of study, this study demonstrated that the resilient healthcare theoretical lens is a worthwhile endeavour for understanding and improving the safety of healthcare systems. Researchers should continue to pursue ways to understand and improve the organisational resilience of healthcare systems. There should be more application of this theory in practice to develop an evidence base of its value. The multi-phase process developed and implemented in this thesis provides a means for doing so. Researchers should continue to work together with healthcare professionals for more effective healthcare safety research.

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214. Wreathall, J. (2009). Measuring Resilience. In. Nemeth, C., Hollnagel, E. & Dekker, S., (Eds). Resilience Engineering Perspectives Volume 2: Preparation and Restoration. Ashgate Publishing. Farnham, UK.

215. Xiao, Y. (2005) Artifacts and collaborative work in healthcare: methodological, theoretical, and technological implications of the tangible. Journal of Biomedical Informatics, 38.1, 26-33. DOI:10.1016/j.jbi.2004.11.004

216. Zsambok, C., & Klein, G. (2014). Naturalistic Decision Making. Psychology Press.

Appendix A. Original Resilience Analysis Grid Questions

From: Hollnagel, E. 2010. Epilogue: RAG. the resilience analysis grid. In. Hollnagel, E., Paries, J., Woods, D., Wreathall, J. (Eds). *Resilience Engineering in Practice: A Guidebook.* Ashgate Publishing. Farnham, UK.

Questions for Responding

Event List	What are the event for which the system has a prepared response?
Background	How were these events selected (tradition, regular requirements, design basis, experience, expertise, risk assessment, industry standard, etc.)?
Relevance	When was the list created? How often is it revised? On which basis is it revised? Who is responsible for maintaining and evaluating the list?
Threshold	When is a response activated? What is the triggering criterion or threshold? Is the criterion absolute or does it depend on internal/external factors? Is there a trade-off between e.g. safety and productivity?
Response List	How was the specific type of response list decided? How is it ascertained that it is adequate? (Empirically, or based on analyses or models?)
Speed	How fast is full response ability available? How fast can an effective response be implemented?
Duration	For how long can a 100% effective response be sustained? What is the minimum acceptable response level and how long can it be sustained?
Stop Rule	What is the criterion for ending the response and returning to a 'normal' state?
Response Capability	How many resources are allocated to ensure response readiness (people, equipment, materials)? How many are exclusive for the response potential? Who is responsible for maintaining the response ability?
Verification	How is the readiness to respond maintained? How and when is the readiness to respond verified?

Questions for Monitoring

Indicator List	How have the indicators been defined? (By analysis, by tradition, by industry consensus, by the regulator, by international standards, etc)
Relevance	When was the list created? How often is it revised? On which basis is it revised? Who is responsible for maintaining the list?
Indicator Type	How many of the indications are of the 'leading' type and how many are of the 'lagging'? Do indicators refer to single or aggregated measures?
Validity	How is the validity if an indicator established (regardless of whether it is 'leading' or 'lagging')? Do indicators refer to an articulated process model, or just to 'common sense'?
Measurement Type	What is the nature of the 'measurements'? Qualitative or quantitative? (If quantitative, what kind of scaling is used?)

Measurement Frequency	How often are the measurements made? (Continuously, regularly, every now and then?)
Analysis/ Interpretation	What is the delay between measurement and analysis/interpretation? How many of the measurements are directly meaningful and how many require analysis of some kind? How are the results communicated and used?
Stability	Are the measured effects transient or permanent?
Organisational Support	Is there a regular inspection scheme or schedule? Is it properly resourced?

Questions for Learning

Selection Criteria	Which events are investigated and which are not (frequency, severity, value, etc.)? How is the selection made, which criteria are used? Who makes the selection?
Learning Basis	Does the system try to learn from success (things that go right) as well as from failures (things that go wrong)?
Classification	How are events described? How are data collected and categorised?
Formalisation	Are there any formal procedures for data collection, analysis and learning?
Training	Is there any formal training or organisational support for data collection, analysis and learning?
Learning Style	Is learning a continuous or discrete (event-driven) activity?
Resources	How many resources are allocated to investigation and learning? Are they adequate? Which criteria do they depend upon?
Delay	What is the delay in reporting and learning? How are the outcomes communicated internally and externally?
Learning target	On which level does the learning take effect? (For instance, individual, collective, organisational?
Implementation	How are 'lessons learned' implemented? Regulations, procedures, norms, training, instructions, redesign, reorganisation, etc?

Questions for Anticipating

Expertise	What kind of expertise is relied upon to look into the future (In-house, outsourced?)
Frequency	How often are future threat and opportunities assessed?
Communication	How are the expectations about future events communicated or shared within the system?
Strategy	Does the system have a clearly formulated 'model of the future'?
Model	Is the model or assumptions about the future explicit or implicit? Qualitative or quantitative?
Time Horizon	How far ahead does the system look ahead? Is the time horizon different for, e.g., business and safety?
Acceptability of risk	Which risks are considered acceptable and which unacceptable? On which basis?
Aetiology	What is the assumed nature of the future (threats, opportunities)?
Culture	Is risk awareness part of the organisational culture?

Appendix B. Search Results for Narrative Review

From 2.2.3 Search Method, p.37

Resilience engineering books series and chapters relevant to the narrative review

Book	No. of chapters	Chapters included in review
Hollnagel, E., Woods, D. & Levenson, N. (2006) *Resilience Engineering. Concepts and Precepts.* Ashgate.	22	N/A
Hollnagel, E., Nemeth, C. P. & Dekker, S. (2008). *Resilience Engineering Perspectives, Volume 1: Remaining sensitive to the possibility of failure*. Ashgate.	21	Mendonca, D. (2008). *Measures of Resilient Performance*. Woods, D. & Wreathall, J. (2008). *Stress-strain plots as a basis for assessing system resilience*.
Nemeth, C. P., Hollnagel, E., & Dekker, S. (2009). *Resilience engineering perspectives, Volume 2: preparation and restoration*. Ashgate.	13	Wreathall, J. (2009). *Measuring Resilience.*
Hollnagel, E., Paries, J., David, D. W., & Wreathall, J. (2010). *Resilience engineering in practice: A guidebook*. Ashgate. (Including 2nd Edition published in 2013)	19	Ferreira, P., Wilson, J., Ryan, B., & Sharples, S. (2010). *Measuring Resilience in the Planning of Rail Engineering Work* Hollnagel, E. (2010). *Epilogue: RAG – The Resilience Analysis Grid.*
Sundstrom, G. & Hollnagel, E. (2011). *Governance and Control of Financial Systems*. Ashgate.	11	N/A
Hollnagel, E., Braithwaite, J., & Wears, R. L. (2013). *Resilient health care*. Ashgate. (Including 2nd edition published in 2015)	19	N/A
Nemeth, C. & Hollnagel, E. (2014) *Resilience Engineering in Practice, Volume 2: becoming resilient.* Ashgate.	12	Rankin, A., Lundberg, J. & Woltjer, R. (2014a). *A Framework for Learning from Adaptive Performance.*
Wears, R., Hollnagel, E., Braithwaite, J. (2015). *Resilient Health Care, Volume 2.* Ashgate.	18	N/A

Resilience Engineering Association symposia and proceedings relevant to the narrative review

Symposium	Conference proceedings	Conference proceedings included in review
2nd Resilience Engineering Association Symposium. Sophia Antipolis, France. November 2006.	45	Woods, D., Wreathall, J. & Anders, S. (2006). Stress-strain plots as a model of an organisation's resilience
3rd Resilience Engineering Association Symposium. Antibes – Juans les Pins, France. October 2008.	33	Johansson, B. & Lindgren, M. (2008). A quick and dirty evaluation of resilience enhancing properties in safety critical systems Stolker, R., Karydas, D., & Rouvroye, J. (2008,). A comprehensive approach to assess operational resilience Woltjer, R. (2008). Resilience assessment based on models of functional resonance.
4th Resilience Engineering Association Symposium. Sophia Antipolis, France. June 2011.	4 (only 4 available from Resilience Engineering Association website)	Catalan, C. & Robert, B. (2011) Evaluation of organisational resilience: application to essential systems in Quebec. **Unavailable in English**
5th Resilience Engineering Association Symposium. Soesterberg, Netherlands. June 2013.	41	Grecco, C., Vidal, M., Cosenza, C., dos Santos, V. & Carvalho, P. (2013). A Fuzzy Model to Assess Resilience for Safety Management Herrera, I. A., Vennesland, A., Pasquini, A., & Silvagni, S. (2013). Planning Measuring Resilience Potential and Early Warnings (SCALES). Lundberg, J. & Woltjer, R. (2013) The Resilience Analysis Matrix (RAM): Visualising functional dependencies in complex socio-technical systems. Siegel, W. & Schraagen, J. (2013). Developing resilience signals for the Dutch railway system. Woods, D., Chan, Y. & Wreathall, J. (2013). The Stress-Strain model of resilience operationalizes the four cornerstones of resilience engineering.
6th Resilience Engineering Symposium Association.	57	Rigaud, E., Neveu, C., Langa, S. & Obrist, M. (2015). Sociotechnical System Resilience Assessment and Improvement Method.

Lisbon, Portugal. June 2015.		Saurin, T. (2015). Classification and assessment of slack: Implications for resilience.
7th Resilience Engineering Association Symposium. Luik, Belgium. June 2017.	29	Patriarca, R., Di Gravio, G., Constantino, F. & Tronci, M. (2017). FRAM to assess performance variability in everyday work: functional resonance in the railway domain.

Peer-reviewed academic journals and articles relevant to the narrative review

Journal Title	No. of articles after search criteria applied	Articles relevant to the review
Reliability Engineering and System Safety Last accessed 10/10/18	65	Furniss, D., Back, J., Blandford, A., Hildebrandt, M. & Broberg, H (2011). A resilience markers framework for small teams. van der Beek, D., & Schraagen, J. M. (2015). ADAPTER: Analysing and developing adaptability and performance in teams to enhance resilience Francis, R. & Bekera, B. (2014). A metric and frameworks for resilience analysis of engineered and infrastructure systems. Mendonça, D. & Wallace, W.A. (2015). Factors underlying organizational resilience: The case of electric power restoration in New York City after 11 September 2001. Saurin, T., & Werle, N. (2017). A framework for the analysis of slack in socio-technical systems
Cognition, Technology and Work Last accessed 10/10/18	32	Shirali, G., Motamedzade, M., Mohammadfam, I., Ebrahimipour, V. & Moghimbeigi, A. (2015). Assessment of resilience engineering factors based on system properties in a process industry. Raben, D., Bogh, S., Viskum, B., Mikkelsen, K. L., & Hollnagel, E. (2017). Proposing leading indicators for blood sampling: application of a method based on the principles of resilient healthcare

Safety Science Last accessed 10/10/18	153	Azadeh, A., Salehi, V., Arvan, M. & Dolatkhah, M. (2014) Assessment of resilience engineering factors in high-risk environments by fuzzy cognitive maps: A petrochemical plant Stroeve, S. & Everdij, M. (2017). Agent-based modelling and mental simulation for resilience engineering in air transport Rubio-Romero, J., Pardo-Ferreira, M., De la Varga-Salto, J. & Galindo-Reyes, F. (2018). Composite leading indicator to assess the resilience engineering in occupational health & safety in municipal solid waste management companies Jain, P., Mentzer, R., & Mannan, M. (2018). Resilience metrics for improved process-risk decision making: Survey, analysis and application.

Further literature identified from reading the references and citations of relevant books chapters, symposia proceedings and journal articles

Title	Type of literature	Paper
Probabilistic Safety Assessment and Management conference 10	Conference Proceeding	Øien, K., Massaiu, S., Tinmannsvik, R. & Størseth, F. (2010). Development of early warning indicators based on resilience engineering.
International Journal of Industrial Economics	Journal Article	Saurin, T. & Junior, G. (2012). A framework for identifying and analyzing sources of resilience and brittleness: a case study of two air taxi carriers.
Journal of Cognitive Engineering and Decision Making	Journal Article	Rankin, A., Lundberg, J., Woltjer, R., Rollenhagen, C. & Hollnagel, E. (2014). Resilience in Everyday Operations: A Framework for Analyzing Adaptations in High-Risk Work.

Appendix C. Transcription Guidelines

From: Tracy, S. (2012). *Qualitative Research Methods*. John Wiley & Sons. Chichester, UK.

Common transcribing symbols

Explanation	Symbol	Example
Stretched sound, syllable, word	Colon(s) : ::	But I re:ally wanted a milkshake.
Emphasis	*Italics*	She should have *asked* me what I wanted.
Brief pause (less than 2 sec)	(.) parens surrounding period	Well (.) I don't care if it's cold outside.
Longer pause (specified seconds)	(#) parens surrounding number of seconds of pause	I prefer chocolate ice cream because (4), hmmm, (2) I'm just a chocolate person.
Transcriber comments about context	((words)) double parens around comment	I gave you a five dollar bill, so you owe me two fifteen. ((participant talking with and getting change from the cashier))
Transcriber uncertainty about what said	(unclear word) parens around the unclear word	I (subscribe) to an (anti) fruit and vegetable diet plan most the time.
Statement that fell in vocal pitch	. Period	Healthy food seems boring to me.
Statement that rises in vocal pitch	? Question mark	Why should I eat healthy when I'm just going to die anyway?
Animated speech	Exclamation point!	I'm so excited for my new juicer!
Vocal noises	(SOUND OF NOISE) parens around all caps	(GULP) Juicing is healthy? Hmmm, I may need to boycott it then. (LAUGHTER)
Contiguous utterances	= Equal sign	*Interviewer*: It seems your health practice and health rhetoric don't exactly match=*Respondent*: =I kind of have a split personality
Speech overlap	[Single left bracket	*Interviewer*: Why did that paradox develop? *Respondent*: [I think I am kind of a rebel at heart.
Abrupt cut-off word or sentence	- Hyphen	Well, just because I'm a paradox-
Comparatively high volume	CAPS	I am SO TIRED of the conflicting information we get about nutrition.
Audible outbreaths, including laughter	hhh (the longer the more hs)	It's kind of funny, hhh, that, hhh, even though I don't care about health food, I'm a rule follower in other parts of my life.

Explanation	Symbol	Example
Audible inbreaths, including surprise	.hhh (period then hs)	.hhh Oh my gosh! I can't believe you said that!
Words omitted from sentence	[…] three equally spaced dots (ellipse) inside brackets	When I exercise, especially when I swim […] I get ravenous later in the day.
Sentence omitted from excerpt	. […] four dots (or rather full stop and ellipse in brackets, with space between)	A question is when I am going to eat. […] My trainer says to eat within 20 minutes after a workout.
Multiple sentences omitted from excerpt	// double slash	Milkshakes are my decadence. // And the very best flavor of all is peanut butter chocolate malt.
Words written by transcriber (for clarification, summary, or confidentiality)	[replacement or additional words]	My favorite is the Dairy Queen [on the west side] because my nana [grandma] used to take me there when I was little. [Participant goes on to talk more about going to Dairy Queen with her grandparents].

Appendix D. Ethical Approval Confirmation

(From 4.2 Method, p.94)

Research Ethics Office

Franklin Wilkins Building
5.9 Waterloo Bridge Wing
Waterloo Road
London SE1 9NH
Telephone 020 7848 4020/4070/4077
rec@kcl.ac.uk

KING'S College LONDON

Matthew Alders

LRS-16/17-3673 - A reflective process for analysing organisational resilience to improve the quality of care

I am pleased to inform you that full approval for your project has been granted by the PNM Research Ethics Panel

- Ethical approval is granted for a period of **three years** from 22 December 2016 . You will not receive a reminder that your approval is about to lapse. It is your responsibility to apply for an extension prior to the project lapsing.
- You should report any untoward events or unforeseen ethical problems to the panel Chair, via the Research Ethics Office, within a week of occurrence. Information about the panel may be accessed at: http://www.kcl.ac.uk/innovation/research/support/ethics/committees/sshl/reps/index.aspx
- If you wish to change your project or request an extension of approval, please complete and submit a Modification Request to crec-lowrisk@kcl.ac.uk. Please quote your ethics reference number, found at the top of this letter, in all correspondence with the Research Ethics Office. Details of how to complete a modification request can be found at: http://www.kcl.ac.uk/innovation/research/support/ethics/applications/modifications.aspx
- All research should be conducted in accordance with the King's College London *Guidelines on Good Practice in Academic Research* available at: http://www.kcl.ac.uk/college/policyzone/assets/files/research/good%20practice%20Sept%2009%20FINAL.pdf

Please note that we may, for auditing purposes, contact you to

ascertain the status of your research. We wish you every

success with your research.

Best wishes,

PNM Research Ethics Panel REP Reviewers

Appendix E. Questions Generated from Focus Group Data

(From 5.2.1.1 Step One – Generate Questions from Focus Group Data, p. 128)

Challenging Patients

1 Do you have multiple strategies for supporting patients with challenging behaviour?
2 As a team do you work together to support someone with challenging behaviour?
3 Do you use different ways to communicate with challenging patients?
4 Do you share ways with other people in your team that are effective for communicating with challenging patients?
5 Do you talk to other members of the team about the decisions you are making for supporting challenging patients?
6 Do you know when you need to escalate the behaviour of a challenging patient?
7 Do you know what strategies to use as a team to support a patient with challenging behaviour?
8 Do you talk about what works and what doesn't work to support a patient with challenging behaviour?
9 Do you talk to other people in your team when you notice someone is behaving in a challenging way?
10 Do you feel as confident to support the behaviour of challenging families as you do challenging patients?
11 Do you know what to do when a patient absconds?
12 Do you ask for help from other members of the team when you are supporting the behaviour of a challenging patient?
13 Do you think about how disruptions early on in your shift are going to effect you later on in your shift?
14 Do you know when to ask for help with a challenging patient?
15 Do you know the best way that everyone can work together to support a patient with challenging behaviour?
16 Are you careful to not assume a patient is challenging from handover from the previous shift?
17 As a team do you talk about what worked for a challenging patient? Do you share this with others?
18 Does the previous shift give you objective information about a challenging patient?
19 When you are getting frustrated with a challenging patient do you tell someone else?
20 Do you use different ways to care for patients with challenging behaviour?
21 Do you share with other members of the team about what has worked well or what has not worked so well when caring for a patient with challenging behaviour?
22 Do you talk to other people in your team about what might be challenging behaviour before it reaches a crisis point?
23 Do you use a series of steps to support a confused patient? Do you talk to other people about what steps are the most appropriate for your particular scenario?
24 Do you talk to your team about what are the most appropriate steps for supporting a confused patient?
25 Do you talk to the other members of the team in the bay about how the interventions to support confused patients are working?
26 Are you involved in conversations about supporting confused patients?
27 Does the team work well together to identify why a patient might be confused and discuss how to ensure they remain safe?
28 Does the team work together so that when there is a challenging patient, the other patients are also cared for?

29 Do you objectively hand over to the next shift what has worked well for a challenging patient?
30 Does information about challenging patients get saved in a place that can be used for the next admission?
31 Do you know when security has been called for a patient in another zone?
32 Do you have the training you need to support mental health patients?
33 Do you talk to the RMN to discuss how you can work together to best support the mental health needs of a patient?
34 Do you talk to the RMN about what is expected of them during the course of their shift?
35 Does the team discuss the criteria for escalating the behaviour of a challenging patient to security?
36 Do you feel confident identifying a pattern of deteriorating behaviour and understand when this may escalated to a crisis point?
37 Do you know what to do when a patient absconds and there are concerns about capacity/IV access?
38 Is the team good at discussing complex decisions regarding the capacity of a patient with everyone that is involved with their care?
39 Are you confident with assessing capacity?
40 Are you involved with capacity assessments of patients that you are looking after?
41 Do you know when you need to escalate decisions regarding patient capacity?
42 Do you understand the legislation around capacity and deprivation of liberty?
43 Do you feel confident caring for someone that is under section? Do you know how to talk to them?
44 Does the team share successful ways of caring for patients with challenging behaviour in a structured way?
45 Do you know when a patient's behaviour may be challenging later in the day? Do you tell someone about this?
46 Are you involved in decisions around supporting confused patients to prevent them falling out of bed?
47 Do you know when someone requires specialing in your zone? In another zone?
48 Who decides what gets mentioned in handover?
49 Do you know when someone gets confused in your bay?
50 Does the team support families to get the information they need about their relative's condition?
51 Deteriorating Patients
52 Do you have multiple strategies to deal with challenging patients?
53 Do you feel confident to raise your concerns about a deteriorating patient to other members of the team?
54 Do you feel confident to raise your concerns about a deteriorating patient? To HCAs? To nurses? To doctors?
55 Do you find the protocol for escalation helpful?
56 If the protocol for escalation is not helpful, do you know what to do?
57 Do you feel confident knowing when to escalate?
58 Do you know what to do when the protocol for escalation is not helpful?
59 Do you involve the team allocated to look after that patient in decisions regarding how to escalate that patient?
60 Do you feel confident knowing when to escalate?
61 Do you know what to do when you don't get the response to escalating your patient?
62 Are you always aware when a patient you are looking after is deteriorating?
63 When you are looking after a deteriorating patient, do you know where can get support for your other patients?
64 Do you feel able to delegate to others when your work load is too much?
65 Do you feel 'everyone is on the same page' when you are working in a team?

66 Do you get feedback about a patient's condition once you have escalated them?
67 Are you involved with the decision making around deteriorating patients?
68 Do you feel confident knowing when to escalate a deteriorating patient?
69 Is the protocol for escalation (always?) helpful? When it is not do you know what to do?
70 Do you feel confident making decisions around prioritisation of care for your allocated bay of patients when you've got a deteriorating patient?
71 Do you know where and how to get help when your workload is too much?
72 When you are looking after a deteriorating patient, do you know where to get support for your other patients?
73 Do you feel confident getting prepared for a sick patient coming from ED?
74 Do you feel confident delegating tasks when it is busy?
75 Do you feel confident making decisions about care when it is busy, e.g. prioritising?
76 Do you ask for help when you have an unwell patient?
77 Do you feel confident escalating when your workload has unexpectedly increased?
78 Do you tell other members of the team in your zone when there is an unwell patient?
79 Do you tell other members of the team in your bay when there is an unwell patient?
80 Do you feel confident escalating a patient early?
81 Do you feel confident escalating a patient when their NEWS is >2?
82 Do you feel comfortable escalating who you are worried about before they deteriorate?
83 Do you feel confident using your clinical judgement in combination with the escalation protocol?
84 Do you feel comfortable escalating a patient early?
85 Do you let other people in your team know that you are escalating a patient early?
86 Do you involve others in the decision making around deteriorating patients?
87 Do you involve other members of the team in the bay you are working with decisions around prioritisation of care?
88 Do you involve other members of the team in the zone you are working with decisions around prioritisation of care?
89 Do you always put observations into enoting straight away?
90 Are you always aware when one of your allocated patients is deteriorating?
91 Do you feel confident with knowing what to do when a patient is deteriorating?
92 Do you know what is going on with the plans of care for the patients in your allocated bay?
93 Do you know when there are unwell patients in other zones?
94 Do you tell the nurse in charge when have an unwell patient?
95 Do you know when other zones are busier than yours?
96 Do you know when other zones have unwell patients?
97 Do you feel confident supporting bank or agency staff when they are in your zone?
98 Do you feel confident knowing when to escalate?
99 Are you aware of how your current work load will affect your future work load?
100 Do you know what to know when you don't get the response to escalation you were expecting?
101 Once you have escalated a deteriorating patient, are you aware of the decisions made to support that patient?
102 When looking after a deteriorating patient, do know when you should delegate to others to help care for the other patients in the bay?

Deteriorating Patients

103 Do you have multiple strategies to deal with challenging patients?
104 Do you feel confident to raise your concerns about a deteriorating patient to other members of the team?

105 Do you feel confident to raise your concerns about a deteriorating patient? To HCAs? To nurses? To doctors?
106 Do you find the protocol for escalation helpful?
107 If the protocol for escalation is not helpful, do you know what to do?
108 Do you feel confident knowing when to escalate?
109 Do you know what to do when the protocol for escalation is not helpful?
110 Do you involve the team allocated to look after that patient in decisions regarding how to escalate that patient?
111 Do you feel confident knowing when to escalate?
112 Do you know what to do when you don't get the response to escalating your patient?
113 Are you always aware when a patient you are looking after is deteriorating?
114 When you are looking after a deteriorating patient, do you know where can get support for your other patients?
115 Do you feel able to delegate to others when your work load is too much?
116 Do you feel 'everyone is on the same page' when you are working in a team?
117 Do you get feedback about a patient's condition once you have escalated them?
118 Are you involved with the decision making around deteriorating patients?
119 Do you feel confident knowing when to escalate a deteriorating patient?
120 Is the protocol for escalation (always?) helpful? When it is not do you know what to do?
121 Do you feel confident making decisions around prioritisation of care for your allocated bay of patients when you've got a deteriorating patient?
122 Do you know where and how to get help when your workload is too much?
123 When you are looking after a deteriorating patient, do you know where to get support for your other patients?
124 Do you feel confident getting prepared for a sick patient coming from ED?
125 Do you feel confident delegating tasks when it is busy?
126 Do you feel confident making decisions about care when it is busy, e.g. prioritising?
127 Do you ask for help when you have an unwell patient?
128 Do you feel confident escalating when your workload has unexpectedly increased?
129 Do you tell other members of the team in your zone when there is an unwell patient?
130 Do you tell other members of the team in your bay when there is an unwell patient?
131 Do you feel confident escalating a patient early?
132 Do you feel confident escalating a patient when their NEWS is >2?
133 Do you feel comfortable escalating who you are worried about before they deteriorate?
134 Do you feel confident using your clinical judgement in combination with the escalation protocol?
135 Do you feel comfortable escalating a patient early?
136 Do you let other people in your team know that you are escalating a patient early?
137 Do you involve others in the decision making around deteriorating patients?
138 Do you involve other members of the team in the bay you are working with decisions around prioritisation of care?
139 Do you involve other members of the team in the zone you are working with decisions around prioritisation of care?
140 Do you always put observations into enoting straight away?
141 Are you always aware when one of your allocated patients is deteriorating?
142 Do you feel confident with knowing what to do when a patient is deteriorating?
143 Do you know what is going on with the plans of care for the patients in your allocated bay?
144 Do you know when there are unwell patients in other zones?
145 Do you tell the nurse in charge when have an unwell patient?
146 Do you know when other zones are busier than yours?
147 Do you know when other zones have unwell patients?
148 Do you feel confident supporting bank or agency staff when they are in your zone?

149 Do you feel confident knowing when to escalate?
150 Are you aware of how your current work load will affect your future work load?
151 Do you know what to know when you don't get the response to escalation you were expecting?
152 Once you have escalated a deteriorating patient, are you aware of the decisions made to support that patient?
153 When looking after a deteriorating patient, do know when you should delegate to others to help care for the other patients in the bay?

Equipment Problems

154 Is it easy to report broken equipment?

Language Barrier

155 Do you have multiple strategies for communicating with patients that do not speak English?
156 Do you feel confident communicating with a patient that does not speak English?
157 Do you think you have a good understanding of the language skills of your team?
158 Do you know what to do when you are having difficulty communicating with a patient that does not speak English?
159 Do you involve other members of the MDT to help communicate with patients that do not speak English?
160 Do you think that your team is effective at communicating with patients that do not speak English?
161 Do you know what to do when your attempt at communicating with a non -English speaker does not appear to be working?
162 Do you know when other members of the team speak a language that you require to communicate with your patients?
163 When your attempts to communicate with a patient are not effective, do you know what you should do next?

Admissions

164 Do you tell someone when an admission from the ED is more unwell then you were initially informed?
165 Is there always a mismatch between the ED handover and the patient condition on admission?
166 Do you have difficulty escalating a patient who has just arrived from the ED?
167 Do you do things differently when the transfer nurse brings a patient round from the ED?
168 Are you confident responding to an unwell patient from the ED?
169 Do you feel confident escalating a new patient from the ED to the medical team?
170 Do you talk to the ED nurse about your concerns with new patients?
171 Do you know what to do if you don't get the response to escalation that you wanted?
172 Do you ask for help when you receive multiple patients from ED at the same time?
173 Do you know what is wrong with a new patient when they arrive on the ward?
174 Are you always aware that you are getting a new patient from the ED?
175 Do you always know what the presenting complaint of the new patient is?
176 Does someone tell you what a new patient is being admitted with?
177 Do you know if a new patient needs a pat slide before they arrive on the ward?
178 Do you always know if a patient needs an air mattress before they arrive?
179 Do you normally have an air mattress inflated for a patient that needs one before they arrive on the ward?

180 Do you get the information you need from the transfer nurse?
181 Do you know when you are getting multiple admissions into the same bay?
182 Do you feel you are able to prepare sufficiently for new admissions with the information you are given from ED handover?
183 Do you know enough about the patient from the bed manager handover on the phone?
184 Do you know enough about the patient from the bed manager handover?
185 Do you feel confident preparing for a new admission if you sufficient information?
186 Do you feel you have more time to prepare for admissions on a night shift?
187 Do you feel confident checking treatment protocols for new patients from the ED?
188 Do you ask for help when a new patient is admitted from the ED with a complex treatment protocol?
189 Do you feel able to handover a workload to the next shift?

Discharges

190 Do you feel confident managing the discharge process?
191 Are you confident with your knowledge about what can hold up a discharge and what you can do about it?
192 Do you get enough support from other members of the MDT to support complex discharges?
193 Do you feel confident managing patient expectations about discharge information? E.g. Times
194 Do you know what the criteria are for using the discharge lounge?
195 Do you feel confident to facilitate complex discharges?
196 Do you feel you get enough support from other team members with complex discharges?
197 Is it always the same things that are difficult about complex discharges?
198 Do you always have the information you need for complex discharges?
199 Do you feel able to raise your concerns about sending someone home?
200 Do you know what needs to be done to discharge a patient at the weekend?
201 If you cannot get the information you need about a complex discharge do you know who to talk to?
202 When there are multiple people involved in a complex discharge, do you know the current state of the work?
203 Do you think that complex discharges fail for the same reasons?
204 Do you feel confident with responding to unexpected difficulties with complex discharges?
205 Do you tell others when you are having difficulty with complex discharges?
206 Do you feel able to raise your concerns with discharging patients home?
207 Are other members of the MDT effective at communicating when involved in complex discharges?
208 Do you know when other members of the MDT have completed their element of the work involved with a complex discharge?
209 Do you have multiple strategies for facilitating a complex discharge?
210 Do you find the discharge care plan useful?
211 Do you get enough information about discharging a patient from the admission process?
212 Are you confident in managing the expectations of patients around the day and time of their discharge?
213 Do you feel confident talking to patients about their discharge?
214 Do you feel confident talking to other members of the MDT about a complex discharge?
215 Do you think other members of the MDT could be involved to a greater capacity?

216 Do you feel confident communicating with patients about their discharge when there are delays?
217 Do all the members of the MDT communicate to patients in the same way about their discharge?
218 Is everyone on the same page when many people are involved in a complex discharge?
219 Do you get the support you need when facilitating a complex discharge?
220 When there are others involved in facilitating a complex discharge, do you feel that you have the most up to date information?
221 Do huddles help with your understanding of what is going on in the zone?
222 Do you feel able to raise your concerns about patients in a huddle?
223 Do you know how to use the pharmacy tracker for information about TTO's?
224 Do you know when the TTOs are ready for a patient?
225 Do you feel confident explaining TTOs to a patient?
226 Is booking transport straightforward?
227 Do you regularly send patients to the discharge lounge?
228 Do you think that everyone has the same checklist (internal) when they are discharging patients?
229 When it gets busy do you ask for more help with facilitating a complex discharge?
230 Do you feel you have enough time to sit with patients and go through their complex discharge with them?
231 Do you use the discharge lounge for patients going home?

Transfers

232 Do you have multiple ways for facilitating the transfer process to other wards?
233 Do the decisions you make about transferring patients change in response to pressure from the ED?
234 Do you know what to do when a ward says they are not ready to take handover?
235 Do you tell other people in your zone when you have unsuccessfully attempted to phone another ward to handover a patient?
236 Do you find it difficult to talk to other wards to handover?
237 Do you know what to do when a ward says they are not ready to take handover?
238 Do you know when you need to talk to the bed manager when trying to Transfer a patient?
239 Do you tell other people in your zone when you are having difficulty transferring a patient?
240 Do you know where to look for porters when you can't see them?
241 Do you tell someone if you are having difficulty finding porters?
242 Do you tell everyone in the bay allocated to look after that patient about the status of their transfer?
243 Are you aware when one of your allocated patients is due to move to another ward?
244 Are you aware when one of your allocated patients has been handed over to another ward and has been packed up?
245 Do you tell all the other members of the team allocated to look after a patient that they are due to go to another ward?
246 Are you comfortable sending patients to another ward without all of their care tasks being completed?
247 Do you tell others when your priorities change about transferring patients due to pressure from the ED?
248 Do you know when other members of your team change their priorities about transferring patients due to pressure from the ED?
249 When your patient has been allocated a bed on another ward, do you talk to other members of your team about who is going to handover and when?

250 When your patient has been allocated a bed on another ward do you know who is going to do the telephone handover?
251 Do you know what to do if relatives are refusing to let a patient go to another ward?

Workload

252 Do you tell someone when a new admission means that you are no longer able to do the work you wanted with other patients?
253 Do you know when the team in your zone has been reconfigured to account for specialing in the numbers, sickness etc?
254 Do people in your zone discuss when they are changing the way they work in response to the pressure in the zone?
255 Do you tell the people you are working with in your bay about the prioritisation decisions you are making with patient care?
256 Do you tell people when your patient requires complex interventions according to protocol?
257 Do you tell someone when your patient requires complex treatment?
258 Do you tell someone when your workload changes unexpectedly and you are worried that you going to get behind?
259 Do you have a clear discussion with the RMN about how you will work together to support a patient with mental health needs?
260 Do you tell others in your zone when you need to change the way you are working in response to pressures in your bay, e.g. specialing a patient, looking after a deteriorating patient?
261 Do you involve other people in your bay or zone about the decisions you are making about the prioritisation of care for your allocated patients?

Agency and Bank Staff

262 Do you work differently when you are working with an agency staff member?
263 Do you check the medication case load of agency/bank nurses that are in your zone?
264 Do you know what situations it would be appropriate to do the morning medications for the next shift coming in?
265 Do you talk to other people when you think it might be appropriate to do the morning medications for the next shift coming in?
266 Do you need to regularly support agency nurses with accessing computer systems to document patient care?
267 Do you know how to change the way you work to support bank/agency staff?
268 Are you confident with how to change your priorities when you are short staffed?
269 Do you regularly monitor the progress of workload for agency/bank staff?
270 Do you feel confident supporting RMNs to do their work?
271 Are you confident with introducing an agency/bank member of staff to the work on the ward?
272 Do you feel confident supporting members of staff that are less experienced than you?
273 Do you feel that you work well with RMNs?
274 Do you always tell someone when you need to ‘special in the numbers’?

Newly Qualified Staff

275 Do you feel confident supporting new members of staff?
276 Do you understand how the work changes when there are new members of staff in your team?
277 Do you know how to get the help you need when working with a new member of staff?

278 Do you know what skills/expertise the other members in your team have? E.g. Bloods, male catheters
279 Did you find the preceptorship programme at St.Thomas' useful?
280 Do you know when people in your team are unable to perform certain tasks, e.g. unable to administer medication?
281 Do you tell others when members of your team are unable to do certain tasks, like administer medication?
282 Do you feel comfortable escalating to more senior members of staff when you think your team is unable to manage?
283 Do senior members of staff know when you are unable to do certain tasks?
284 Do you feel confident delegating work to others?
285 Do you feel confident delegating to other members of your team?
286 Do you know how busy other people in your zone are?
287 Do you know when other people in your zone are busy?
288 Do you consider yourself to be new to the ward?
289 Do you feel able to say when you are too busy?
290 Are you confident with raising a red flag?
291 Do you ask for help from your team?
292 Do you feel able to support others in your team?
293 Do you tell other people in your team what you are doing? What you have done? What you are going to do? What you are going to do in the next two hours?
294 Do you tell others when you are getting busy?
295 Do you know where to get help when you need it?
296 Do you feel confident talking to a member of the team when you see them doing something wrong?
297 Do you feel able to support members of the team with less experience than you?
298 Do you tell others when you are feeling overwhelmed?

Skill Mix

299 Do you know what skills your team are credited with?
300 Do you know which members of your team have passed which competencies?
301 Do you feel confident to support new staff develop new skills?
302 Is the team able to identify when an incoming shift needs additional support, e.g. with morning medications, due to skill mix?
303 Do people listen to you at work?
304 Do you understand how the team needs to change when working with agency/bank/short staffing?
305 Do you feel comfortable supporting an RMN to care for someone with mental health needs?

Staff Shortages

306 Is the team good at recognising when the next shift will struggle due to skill mix and attempt to alleviate some workload, e.g. do medications early? Move unwell patients?
307 Do you know how the team needs to change the way it works due to short staffing?

Teamwork

308 Do you get help from others when you are busy?
309 Do people help you when you ask for help with your workload?
310 Do you feel that you know what is going on with the patients in your bay?
311 Do people tell you when there is a change in the plan with one of your patients?
312 Do you tell someone if there is not good team work?

313 Do you feel like your opinion is valued when decisions are made about patient care in your allocated bay?
314 Do you ask for help when you need it?
315 Does everyone in the bay know when someone is poorly?
316 Do you tell everyone working in your bay when a patient is unwell AND what needs to happen next?
317 Does someone tell you when a patient in your bay is sick and what you need to do next?
318 Do you know what to do if someone in your team isn't working well?
319 Are you aware when there is not much team work between people in your bay and can you address this?
320 Does everyone in the zone know when there are new admissions coming in?
321 Do you know what to do when you don't get the response from other teams that you need?
322 Do you tell everyone in the zone when the team needs to reconfigure to account for specialing in the numbers, sickness, someone can't do meds etc?
323 Do you know when other members of your team are more free than you and can help?
324 Do you know where to get help outside of the team in your bay?
325 Do you know when you need to get help from outside the bay?
326 Do you involve all members of the team in your bay with decisions around patient care?
327 Do you feel like a valued member of the team?
328 Do you tell the nurse in charge/coordinator when the work load increases unexpectedly?
329 Do you know when there is a sick patient in your zone?
330 Do you know when there is a deteriorating patient in your zone?
331 Are you involved in discussions about supporting patients that do not have capacity?
332 Do you find the huddles useful for understanding what the workload is like for other members of your team in your zone?

Communication

333 Do you feel like there is good communication between the team you are working with?
334 Do you always feel that you are able to raise your concerns about the patients you are working with?
335 Do you have multiple strategies for dealing with people in the team do not communicate well?
336 Do you make sure that everyone in your team knows when you have an unwell patient?
337 Do you get the information you need when you move to a different part of the ward/zone in response to patient demand/short staffing?
338 Are you confident with communicating when the demands of the zone mean that things need to be rearranged?
339 Do you feel confident to gain help from the rest of the team when your workload is beyond your individual capacity?
340 Do you have multiple strategies to respond to a lack of communication between your team?
341 Do you feel able to raise your concerns about lack of communication with members of your team?
342 Do you know how busy other zones are compared to yours?
343 Do you know about the status of other team members in the zone?
344 Do huddles help with your understanding of the work load of the zone?
345 Do you have multiple strategies for dealing with other members of the MDT that do not communicate effectively?
346 Do you know when other people on the ward are busier than you/your zone?

347 Do people communicate their decisions regarding patient care to you?
348 Does everyone communicate in the same way?
349 Do you tell the other people working with the same patient allocation what you are going to be doing?
350 Do you know where to go to get support for communicating with other members of the MDT?
351 Do you feel like other members of the team looking after patients in a bay communicate their decisions with you?
352 Does the effectiveness of communication change throughout the day?
353 Do you have multiple strategies for communicating with healthcare professionals that are not based on the admissions ward?
354 Experience
355 If you can't get the help you need from your team, do you know where to go?
356 Do you get support from senior colleagues?
357 Do you have the training you need to do your job?
358 Do you feel confident to make decisions around medication administration?
359 Is the team good at anticipating when the next shift on my struggle with skill mix and identify how this should be supported?
360 Do you ask for help from more senior colleagues when you are unsure how to manage a situation?
361 Do you feel confident supporting patients with mental health needs?
362 Do you feel confident supporting patients in a mental health crisis?
363 Do you share with your colleagues which strategies have helped for caring for them?
364 Do you know when to ask for help with challenging patients or patients with mental health needs?
365 Are there some parts of the discharge process that are always difficult?
366 Do you know where to find the numbers you need to contact the various teams necessary to support a patient when they are discharged?
367 Are you able to find the numbers you need for discharging patients from the information we have on the ward?
368 Do you know when other zones have patients to be transferred to the same ward as yours?
369 Do you know why a patient needs to be in a sideroom?

Context

370 Do you feel confident with your ability to prioritise patient care?
371 Is it easier to know what is going in across the whole ward when you are in certain zones?
372 Does everyone do the nurse in charge role the same?
373 Do you involve all the nursing team in the decisions around caring for complex patients?
374 Do you feel confident with your ability to prioritise when there are external pressures to the ward?

Nurse in Charge

375 Do you feel confident to talk to your colleagues when they are doing things you are concerned about?
376 Do you feel confident in raising concerns about the workload of your zone?
377 Do you know what is going on in the other zones?
378 Do you always get your breaks?
379 Is it difficult to support others to take their breaks?
380 Do you know when someone in the zone is worried about a patient?
381 Do people undertake the nurse in charge role differently?

382 Do you involve other members of the team in your bay about how you are deciding to do your work?
383 Do other members of the team in your bay involve you in their decision making?
384 Does everyone do the nurse in charge role in the same way?
385 Do you know who needs support in your zone?
386 Do you know who are the most unwell patients in your zone?
387 Do you involve other members of the team in that bay/zone about how to care for challenging patients? (And the reverse of that)
388 Do you know when someone else has handed over your patient to another ward?
389 Do you think that it is important to know?

Coordinator

390 Do you feel able to approach senior staff when you are unsure how to respond to a situation?
391 Do you feel confident to approach senior staff when you are struggling with your workload?
392 Is there much difference between the way the coordinators work?
393 Does the nurse in charge know how busy other zones are?
394 Do you tell the coordinator when you are busy?
395 Does the nurse in charge know when you are busy?
396 Does the coordinator know when you are busy?
397 Do senior members of the team help support your development?
398 Do you feel able to communicate your concerns when external/internal pressures are pulling you in different directions?

Reflection

399 Do you get a chance to talk to other people in your team about why you thought a day went well or not so well?

Tension Between Roles

400 Do you tell someone when you are feeling stressed about your workload?
401 Are you involved with care decisions in the bay you are working in?
402 Are you involved with decisions for patient care?
403 Do you tell other members of the team about the progress being made with plans of care for patients in your bay?
404 Do you know what to do when you get the response you need?

What it feels like to work on the ward

405 Do you notice when other people in your zone are struggling?
406 Do you get help from other zones when you need it?
407 Do you help others stay positive at work?
408 Do people tell you when they need help?
409 Do you feel like you get recognition for working hard during the day?
410 Can you tell when you need a break?
411 Do you get frustrated when the workload prevents you from doing certain tasks/elements of patient care?
412 Do you talk to people about this frustration?
413 Are you more likely to ask for someone to help if you know them better?
414 Does everyone help you out equally?
415 When you are unsure about something do you tell someone?
416 Do you tell someone if you distressed by something at work?

417 Are you confident with caring for someone that has been sectioned?
418 Do you tell someone when your response to a situation isn't working?
419 Do you think about things that have happened at work outside of the ward?
420 Do you recognise when someone else has done well and tell them?
421 Do you feel able to raise your concerns about decisions made around patient care?
422 Do you consider changing your actions based on negative responses from other members of the MDT?
423 Do huddles help you communicate how your day is going?
424 Do you know when the pharmacists have spoken to patients about their TTOs?
425 Are you aware when you are no longer able to keep up with your workload?
426 Can you recognise when you are getting busy and stop to prioritise patient care?

Appendix F. Duplicate Questions Removed in Question Generation Process

(From 5.2.1.3 Step Three – p. 129)

1 Does the previous shift give you objective information about a challenging patient?
2 Do you use a series of steps to support a confused patient? Do you talk to other people about what steps are the most appropriate for your particular scenario?
3 Does the team discuss the criteria for escalating the behaviour of a challenging patient to security?
4 Do you feel as confident with supporting the challenging behaviour of family members as you do supporting the challenging behaviour of a patient?
5 Are you involved with capacity assessments of patients that you are looking after?
6 Are you confident with assessing capacity?
7 Is the protocol for escalation (always?) helpful? When it is not do you know what to do?
8 Do you feel confident escalating a patient early?
9 Are you always aware when a patient is deteriorating?
10 Do you feel comfortable escalating a patient early?
11 Once you have escalated a deteriorating patient, are you always aware of the decision made for that patient?
12 Do you know what to do when your patients have absconded?
13 Do you tell someone when an admission from the ED is more unwell then you were initially informed?
14 Do you tell someone when an admission from the ED is more unwell then you were initially informed?
15 Do you feel confident escalating a new patient from the ED to CRT?
16 Do you tell someone when an admission from the ED is more unwell then you were initially informed?
17 Do you feel confident escalating a patient early?
18 Do you ask for help when you receive multiple patients from ED at the same time?
19 Do you escalate to other members of your team when you receive multiple patients from ED at the same time?
20 Do you feel confident with knowing where to go to find the information out about a new admission from the ED?
21 Are you always told when a patient you are looking after is deteriorating?
22 Do you feel confident knowing how to prepare for the different admissions from the ED?
23 Do you feel confident escalating a new patient from the ED if they are unwell?
24 Do you feel confident knowing what to do if you don't get the response you required when escalating a new unwell patient from the ED?
25 Is it always the same things that are difficult about complex discharges?
26 Is it always the same things that are difficult about complex discharges?
27 Is it always the same thing that is difficult about facilitating a complex discharge?
28 When there are many people involved in a complex discharge, do you always feel that you are up to date with the progress of work?
29 Do you know what the criteria to send a patient to the discharge lounge are?
30 Do you ask for help with complex discharges?
31 Do you tell other people in your zone when you have unsuccessfully attempted to phone another ward to handover a patient?
32 Do you have multiple ways of getting in touch with other wards to hand over?
33 Do you know when to talk to other people in your team if you are having difficulty handing over a patient?
34 Do you tell someone when a new admission means that you are no longer able to do the work you wanted with other patients?

35 Do you know how to change the way you work when working with an agency/bank member of staff?
36 Do you feel confident supporting new members of staff?
37 Do you feel confident changing the way you work to accommodate agency/bank staff?
38 Do you feel confident changing the way you work to accommodate agency/bank staff?
39 Do you feel comfortable delegating to some more than others?
40 Do you understand how the team needs to change when working with agency/bank/short staffing?
41 Do you feel comfortable delegating to others?
42 Is the team good at recognising when the next shift will struggle due to skill mix and attempt to alleviate some workload, e.g. do medications early? Move unwell patients?
43 Do you feel confident using a variety of approaches to care for a confused patient?
44 Do you tell someone in your zone when you need support with your workload?
45 Do you tell someone when you are having difficulty with your workload?
46 When it is getting busy, do you talk to people to tell them what you are prioritising?
47 Do you tell someone when you need help with your work?
48 Do you know when other people in your zone are busier than you?
49 Do you ask for help when your workload increases unexpectedly?
50 Do other people help you when your work load increases unexpectedly?
51 Do you get told information about a new patient that is coming into the ward?
52 Do you involve all the members of a team in a bay when new admissions arrives?
53 Do you know when you need to involve other members of the team to support patients with challenging behaviour?
54 Do you get the support from other members of the team for discharging a patient from hospital?
55 Do all members of the MDT present the patient with the same information about discharge?
56 Do you know when a patient in your bay has been handed over to another ward and has been packed up to be transferred?
57 Do you have multiple strategies for contacting other wards?
58 Do you find huddles useful for finding out everything going on in your zone?
59 Do you know when there is an unwell patient in your team?
60 Do you feel you are involved in the decision making with unwell patients?
61 Do you feel able to escalate your patient caseload when it is beyond your capability to care for patients?
62 Do you feel confident to escalate to other members of your zone when your workload is beyond your capacity?
63 Do you know when other people in your zone are busier than you?
64 Do people communicate what is going on with the patient caseload in the team you have been allocated?
65 Do you talk to all the members of the nursing team allocated to your patient case load about your decision making/prioritisation etc?
66 Do people tell you how busy other parts of the zone are?
67 Do you feel confident using a range of approaches to communicate to other members of the MDT?
68 Do you feel confident to use a range of strategies to communicate with other members of the MDT?
69 Are you always aware when a patient you are looking after is going to be transferred or discharged?
70 Do you feel confident to communicate with patients around the status of their discharge?
71 Are you always aware when a patient you are looking after is going to be transferred or discharged?

72 Are you always aware when a patient you are looking after is going to be transferred or discharged?
73 Do you feel comfortable talking to other members of your team in the bay you are working about concerns you have with patients?
74 Is the protocol for escalation helpful?
75 Do you share decisions about how to respond to deteriorating patients with other members of your team?
76 Do you know what to do when you don't get the response to escalation that you need?
77 Do you get the support you need when your workload is too much?
78 Are you confident asking for help?
79 Do you get enough information for incoming admissions from the bed manager handover?
80 Do you feel confident to escalate a patient early?
81 Are you always aware when there is an unwell patient in your bay?
82 Do you know if other people in your zone are behind with their work?
83 Do you know if other people in your zone are managing their work?
84 Do you get handover for the new patients when they arrive from the ED?
85 Do you feel comfortable prioritising your work load?
86 Do you do things differently with different people?
87 Do you know who to talk to if you need help?
88 Do you prepare for new admissions coming in?
89 Do you ask for help with challenging patients with escalating behaviour?
90 Do you feel confident with your ability to help your colleagues?
91 Do you have multiple strategies for caring for confused patients?
92 Do you know when to ask for help with challenging patients or patients with mental health needs?
93 Do you feel confident caring for someone that does not have capacity?
94 Do you know when to involve other people in decision around capacity?
95 Do you involve everyone in the bay when making decisions around a patient's capacity?
96 Do you use the discharge care plan?
97 Do you find the discharge care plan helpful?
98 Do all members of the MDT give the patient the same information about discharging patients?
99 If there are several members of the team involved in discharging a patient, do you know what the status of the workload is?
100 Do you feel confident raising your concerns about a patient's discharge?
101 Do you think everyone has the same internal checklist for discharging a patient?
102 Do you think everyone has the same internal checklist for discharging a patient?
103 Do you have multiple strategies for transferring patients to another ward?
104 Do you tell someone if you are having difficulty handing over another patient on the phone?
105 Do you know when one of your patients has been handed over to another ward?
106 Does someone tell you when one of your patients is being transferred?
107 Do you involve other people in planning of patient care when external pressures may change this?
108 Do you feel comfortable handing over patients with tasks that are still to do/admission work that still needs to be done?
109 Do you have multiple strategies for getting in touch with other wards on the phone?
110 Do you feel like you get all the information you need about new admissions from the bed manager handover on the phone?
111 Do you feel comfortable to escalate a patient early?
112 Do you know when there are unwell patients in your zone?
113 Do you know how to get more help with your workload?

114 Do you know when other zones are busier than yours?
115 Do you feel confident identifying when the workload of the patients you have been allocated is too much for one person to do?
116 Do you know how busy other people in the zone are compared to you?
117 Does everyone in the zone know when you are getting a new patient?
118 Do you feel confident getting help from other zones?
119 Do you know when other zones are less busy than you?
120 Are you confident to change the way you are working when working with agency or bank staff?
121 Do you know how to get the help you need with a new patient from the ED before they have been seen by the team?
122 Do you know how to get the help you need with a new patient from the ED before they have been seen by the team?
123 Do you feel confident asking for help with challenging patients?
124 Do you feel confident in using a range of strategies for caring for a confused patient?
125 Do you feel confident in supporting an RMN to care for the needs of a mental health patient?
126 Do you feel confident escalating challenging patients to other members of the MDT (security, SNPs, medical team, psych)?
127 Do you feel confident escalating challenging patients to other members of the MDT (security, SNPs, medical team, psych)?
128 Do you know what to do when you don't get the response to escalation that you need?
129 Do you know when the pharmacists have given and explained the TTOs to the patient?
130 Do you involve all members of the team involved with your patient caseload with the progress of the patient and any changes to the plan?
131 Do you confident handing over patients to another ward without a full admission completed?
132 Do you tell others when you are changing your priorities due to external pressures to the ward, e.g. ED needs to transfer patients imminently?
133 Do you know who to talk to when you are having difficulty transferring patients to another ward?
134 Do you know who to talk to when you are having difficulty transferring patients to another ward?
135 Do you know when there is an unwell patient in your zone?
136 Do you know what to do if you don't get the response from other members of the team that you need?
137 Do you tell others when you need help with your workload?

138 Do you feel confident supporting other members of your team?
139 Do you feel confident identifying when other members of your team need some support?
140 Do you feel confident escalating your concerns to more senior members of staff?
141 Do you feel confident escalating your concerns to senior members of staff?
142 Do you know when someone else's bay is busier than yours?
143 Do you know when other zones are busy?
144 Do you know when other zones are busier than yours?
145 Do you feel confident talking to others when you need help?
146 Do you know when other zones are busier than yours?
147 Are you able to identify when someone in your team needs some help?
148 Do you know when other zones are busier than yours?
149 Do you tell others when the workload of your zone is getting too much?
150 Do others tell you when they need help?
151 Do you feel confident explain to bank or agency staff about the routine of the ward?

152 Do you know when someone in your team receives an unwell admission?
153 Do you tell others when there is an unwell person in your bay?
154 Do you tell others how you are changing your work in response to an unwell patient?
155 Do you feel confident supporting other members of your team?
156 Do you tell others when there is an unwell person in your bay?
157 Do you know when someone else is escalating a patient early because they are worried about them?
158 Do you know when there is an unwell patient in the zone?
159 Do you know how people are getting on with their work in your zone?
160 Do people in your zone tell you when they need help?
161 Do you know when there is an unwell patient in the zone?
162 Do you know how everyone is getting on with their work?
163 Do you ask for help when you get multiple admissions at the same time?
164 Do you feel like you get the support you need to look after your patients?
165 Do you know the presenting complaints of new admission from the ED?
166 Do you get the support that you need in order to care for unwell patients in your bay?
167 Are you confident with your knowledge of the capability of your team?
168 Do you know who are the busiest people in your zone?
169 Do you ask for help from other members of the team in your zone?
170 Do you feel like you have a good awareness of the workload of other team members in the zone?
171 Do you feel confident in your ability to help other members of the team in your zone?
172 Do you get support for complex discharges?
173 Do you know the status of a discharge when there are other people involved in it?
174 Do huddles help your understanding of the workload of the zone?
175 Do you have a good awareness of the transfers of your patients?
176 Does everyone do the nurse in charge role the same?
177 Do you feel able to approach senior staff when you are unsure how to respond to a situation?
178 Do you think that the ward is good at identifying when the next shift will be difficult and taking action pre-emptively, e.g. doing morning medications?
179 Do you feel confident to approach senior staff when you see others struggling with their workload?
180 Do you feel confident to approach senior staff when you see others struggling with their workload?
181 Do you know when other zones are busier than you?
182 Do you know when other zones are busier than yours?
183 Do others know when you need help?
184 Do you get the support you need from senior staff?
185 Do you get support from senior staff when you are busy?
186 Do you have a good enough understanding of a patient's condition before they come around from the ED?
187 Do you know when other members of your team need help?
188 Do you know when there is an unwell patient in your zone?
189 Do you feel confident escalating the behaviour of a challenging patient to other members of the team?
190 Are you involved with the capacity assessments of the patient you are looking after?
191 Do you feel confident to undertake a formal capacity assessment?
192 Do you feel confident managing a situation with a patient that does not have capacity?
193 Do you know how to use the pharmacy tracker to look at the status of TTOs?
194 Do you know the criteria for using the discharge lounge?
195 Do you feel involved with decisions make around patients that do not have capacity?

196 Do you feel involved with the decision making for patient care with the bay you are working in?
197 Does someone tell you what the plan is for a patient that is deteriorating in your bay?
198 Do you involve other members of the team working in your bay with the decisions you make for patient care?
199 Does someone tell you what the plan is for a patient that is deteriorating in your bay?
200 Are you aware when decisions are made around reconfiguring the team due to skill mix or staff shortages?
201 Do you feel comfortable delegating other members of the team in your bay/zone?
202 Do you talk to people when there is not good team work in the bay you are working?
203 Are you involved in decisions around patient care for the bay where you are working?
204 Do you get handover for a new patient that has been admitted to your bay?
205 Do other members of the team involve you in decisions being made for the patient care in the bay you have been allocated?
206 Do you involve all team members in the bay about what works best for caring for a patient with challenging behaviour?
207 Do you feel confident supporting an RMN to care for a patient with mental health needs?
208 Do you know when a patient has been handed over and waiting for porters?
209 Do you know when a patient has been handed over and waiting for porters?
210 Do you tell someone when the workload in your zone is increasing?
211 Do you tell someone when a patient deteriorates?
212 Do you find huddles useful?
213 Do you find out who the sick people are in your zone in a huddle?
214 If you're getting frustrated do you tell someone?
215 Do you feel comfortable delegating work to other people in your bay or zone?
216 Do you know what is going on with the patients in your bay during the day?
217 Can you tell when your workload is increasing beyond your individual capacity?
218 Do you feel isolated when your workload is increasing?
219 Do all members of the MDT provide the patient with the same information about discharge?
220 If you are falling behind with your work do you tell people?
221 Do you tell others when you are stressed at work?
222 Do you feel comfortable caring for patients with mental health needs?
223 Do you get enough support caring for patients with mental health needs?
224 Do you tell someone when a patient has been aggressive towards you?
225 Do you feel comfortable with decisions around capacity?
226 Do you feel able to raise your concerns about discharging a patient home?
227 Do you worry about sending some patients home?

Appendix G. First Draft of Survey Questions

(From 5.2.1.3 Step Three – , p.129)

1. Do you feel confident identifying the causes of challenging behaviour? E.g. Delirium, Dementia, Mental health needs, Withdrawing?
2. How confident do you feel de-escalating an aggressive patient?
3. How confident do you feel about monitoring patients' emotional state?
4. How confident do you feel about responding appropriately to a patient's changed emotional state?
5. How often do you have the opportunity to learn from observing how others deal with difficult patients?
6. Do you talk to other members of the team about what has worked with supporting patients with challenging behaviour?
7. How often is there good teamwork with medical staff to manage a difficult patient?
8. Do you feel confident knowing when to escalate a patient with challenging behaviour?
9. How comfortable do you feel judging whether to escalate a patient when the clinical picture is unclear?
10. How confident do you feel that haven't missed anything with a deteriorating patient?
11. How confident do you feel about your judgement about what to do when a patient is deteriorating?
12. How confident do you feel matching your observations/assessment to knowledge about individual patients' reactions/physiology?
13. How confident do you feel managing the social interaction side of escalation? With senior staff, medical staff?
14. How confident are you that there are sufficient resources to provide 1-2-1 care?
15. Do you feel confident supporting a family member with challenging behaviour?
16. Do you feel confident managing a situation where a patient has absconded?
17. Are you involved with discussions around assessing the capacity of a patient you are looking after?
18. Do you feel able to raise your concerns about patient care decisions?
19. Do you feel confident prioritising patient care as things change throughout the day?
20. Do you feel able to tell someone when you feel overwhelmed at work?
21. Does everyone help you out equally?
22. Do you feel confident asking for help?
23. How confident are you that you will receive information in handover allowing you to manage a challenging patient?
24. How confident are you that there is backup/support available if you need it?
25. How often is work left undone because of the workload?
26. Do you know when other people in your team need help?
27. Is there much difference between the way the nurses in charge work?
28. Is there much difference between the way the coordinators work?
29. Does the nurse in charge know when you are busy?
30. Does the coordinator know when you are busy?
31. Do you feel able to support others in your team?
32. Do senior members of the team help support your development?
33. Do people listen to you at work?
34. Do you feel included as a member of the healthcare team?
35. How confident do you feel that responsibility for patients is shared amongst the team?
36. Do you feel confident talking to a member of the team when you see them doing something you do not agree with?
37. Do you tell someone more senior than you if you are worried about your workload?
38. Do you know what to do if you don't get the response to escalation that you wanted?

39. Do you feel confident escalating a patient earlier than the protocol suggests? E.g NEWS <2
40. When the protocol for escalation is not helpful do you know what to do?
41. Do you tell other people in your team when you have concerns about a patient?
42. Do you think about how disruptions early on in the shift are going to affect you later on in the shift?
43. Do you feel able to raise your concerns about a lack of communication between your team?
44. Do huddles help with your understanding of what is going on in the zone?
45. Do you know when the team in your zone has changed the way it is working in response to new demands? Eg. Specialing in the numbers, short staffing, patient acuity
46. How often is the organisation of work/roles and responsibilities discussed within the team?
47. Do you tell other people in your team when a patient in your bay is deteriorating?
48. Are you involved with decisions about care for your allocated patients?
49. Do you know when there is a deteriorating patient in your zone?
50. Do you know when there is a deteriorating patient in your bay?
51. Do you know how busy other zones are compared to yours?
52. Do you feel confident delegating work to other members of your team?
53. Does the team work together so that when there is a challenging patient, the other patients are also cared for?
54. Do you feel confident supporting RMNs to care for patients with mental health needs?
55. Do you have a discussion with an RMN about how you can work together to support a patient with mental health needs?
56. Do you feel confident supporting patients with mental health needs?
57. Do you know what to do when you are having difficulty transferring a patient?
58. When your patient has been allocated a bed on another ward do you know who is going to do the telephone handover?
59. Do you know when one of your allocated patients has been handed over to another ward?
60. Do you know when other zones have patients to be transferred to the same ward as yours?
61. Is it easy to report broken equipment?
62. How often do you need to adjust the way you work if there are bank/agency staff?
63. Do you know how the workload of a zone changes when working with agency or bank staffing?
64. Do you monitor the work of agency or bank staff?
65. Do you feel confident supporting agency or bank staff when they are on the ward?
66. Do you find the discharge care plan useful?
67. Do you know when it is appropriate to use the discharge lounge?
68. Do you feel confident with understanding the difficult aspects of a complex discharge?
69. Do you know where to get the information you need for a complex discharge?
70. Do you get enough information about discharging a patient from the admission process?
71. Do you know how other members of the MDT are doing with a complex discharge of one of your patients?
72. Do you get enough support from the MDT with complex discharges?
73. Do you think other members of the MDT could be involved to a greater capacity?
74. Do you feel able to raise your concerns with discharging patients home?
75. Do you feel confident talking to patients about the status of their discharge?
76. Do you know how to use the pharmacy tracker for information about TTO's?
77. Do you know when the pharmacists have spoken to patients about their TTOs?

78. Do you think that everyone thinks about the same things when they are discharging patients?
79. Do you feel confident using a range of approaches to care for a patient that does not speak English?
80. How confident do you feel that you are able to mentally keep track of what needs to be done without missing things?
81. How confident are you about assessing risk?
82. Do you know what languages your team members speak?
83. Do you have a good understanding of the skills/competencies of the team you are working with?
84. Do you think the team is good at identifying when the next shift may struggle due to skill mix and take pre-emptive action?
85. Do you tell others when members of your team are unable to do certain tasks, like administer medication?
86. Do senior members of staff know when you are unable to do certain tasks?
87. Do you feel confident to support new staff develop new skills?
88. Do you feel you able to prepare for new admissions from the ED with the information you get from the initial telephone handover?
89. Does everyone in the zone know when there are new admissions coming in?
90. Are you always aware that you a new patient is coming into your bay?
91. Do you ask for help when a new patient is admitted from the ED with a complex treatment protocol?
92. Do you have difficulty escalating a patient who has just arrived from the ED?
93. Do you change the way you escalate new admissions from the ED according to which members of the MDT are on the ward?
94. How often is poor communication a problem for providing care to patients?
95. Do you get the information you need from the transfer nurse?
96. Is there always a mismatch between the ED handover and the patient condition on admission?
97. How often do you provide feedback to the ED about patients/handover problems?
98. Does someone tell you what a new patient is being admitted with?
99. Do you think about things that have happened at work outside of the ward?
100. Do you get frustrated when the workload prevents you from doing certain tasks/elements of patient care?
101. Do you recognise when someone else has done well and tell them?
102. Do you feel like you get recognition for working hard during the day?
103. Can you tell when you need a break?
104. Do you tell someone if you are distressed by something at work?
105. Do you consider changing your actions based on negative responses from other members of the MDT?
106. Do you help others stay positive at work?
107. Do you have the training you need to do your job?
108. How often do you feel clear about the organisation of work and roles in your ward?
109. How informed are you about the workload within and between zones?

Appendix H. Rejected Questions from Question Generation Process in Phase Two

(From 5.2.1.5 Step Five – Review Questions for Representation of Focus Group Discussion, p.130)

Challenging Patients

1. Does information about challenging patients get saved in a place that can be used for the next admission?
2. Do you know when security has been called for a patient in another zone?
3. Are you careful to not assume a patient is challenging from handover from the previous shift?
4. Does the previous shift give you objective information about a challenging patient?
5. Do you objectively hand over to the next shift what has worked well for a challenging patient?
6. Are you confident in ensuring that you hand over the a challenging patient in an objective way?
7. Do you feel able to handover a workload to the next shift?

Admissions

8. Do you feel able to handover a workload to the next shift?
9. Who decides what gets mentioned in handover?

Communication

10. Does the effectiveness of communication change throughout the day?
11. Is it easier to know what is going in across the whole ward when you are in certain zones?
12. Who decides what gets mentioned in handover?
13. Does the effectiveness of communication change throughout the day?

Experience

14. Is it easier to know what is going in across the whole ward when you are in certain zones?
15. Are you comfortable sending patients to another ward without all of their care tasks being completed?

Transfers

16. Are you comfortable sending patients to another ward without all of their care tasks being completed?

Agency and Bank Staff

17. Do you work differently when you are working with an agency staff member?

Discharge

18. Is booking transport straightforward?
19. Do you feel you have enough time to sit with patients and go through their complex discharge with them?
20. Do you know when the TTOs are ready for a patient?

Admissions

21. Do you feel you have more time to prepare for admissions on a night shift?

Newly Qualified Staff

22. Did you find the preceptorship programme at the hospital useful?
23. Do you consider yourself to be new to the ward?
24. Do you finder it harder to work during a night shift?
25. What it feels like to work on the ward
26. Do you finder it harder to work during a night shift?
27. Do you tell someone if you are having difficulty finding porters?
28. Do you know where to look for porters when you can’t see them?

Transfers

29. Do you tell someone if you are having difficulty finding porters?

Deteriorating Patients

30. Do you always put observations into enoting straight away?
31. Are you more likely to ask for someone to help if you know them better?
32. Do you tell people when your patient requires complex interventions according to protocol?
33. Does everyone communicate in the same way?

Nurse in Charge

34. Is it difficult to support others to take their breaks?
35. Do you feel confident with knowing what to do when a patient is deteriorating?

Appendix I. Survey for Focus Group Participants in Phase Two

(From 5.2.1.6 Step Six – Send Questions to Expert Group for Review, p.130)

Questions from group discussions

Welcome to the study. This questionnaire forms part of a research project developing a reflective process for analysing organisational resilience to improve the quality of care. The research is being conducted by the Centre for Applied Resilience in Healthcare (CARe).

Thank you very much for taking part in the focus group discussions. They provided great insights into the work of the nursing team on AAW. We have developed a series of statements that represent the discussions. We will use these statements to develop a questionnaire for all of the nursing staff on AAW to complete. The intention of the questionnaire will be to find out how nursing staff on AAW feel they are able to manage the challenges that you mentioned in group discussions.

Before we develop the questionnaire any further, we wanted your opinion on these statements. They will be presented to staff with a scale for rating their agreement. For example:

1. I feel able to raise my concerns when discharging a patient home.

Strongly Disagree 1 2 3 4 5 Strongly Agree

We would like to know whether you think the statements are relevant to your work and useful to ask the nursing staff on the ward. For each statement think about whether the answer would be helpful for understanding the challenges of nursing on the ward. And whether you think they should be included in the final questionnaire.

All the information that you give us will be kept confidential. Your name will not appear on the questionnaire and any reports of the information will be completely anonymous so that your identity cannot be connected with specific answers you give.

There are 54 statements to review, with the opportunity to comment on each statement in case you think it could be improved (although this is not required). This questionnaire should take about 20 to 25 minutes to complete.

Thank you very much for your time.

* Required

Please rate on a scale, from 1 to 4, whether you think each statement should be included in the final questionnaire.

1. **1. I feel confident identifying the causes of challenging behaviour E.g. Delirium, Dementia, Mental health needs, Withdrawal.** *

Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

2. **Do you have any suggestions for this statement?**

3. **2. I feel confident about monitoring a patient's emotional state.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

4. **Do you have any suggestions for this statement?**

5. **3. I feel confident about responding appropriately to a patient's changed emotional state.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

6. **Do you have any suggestions for this statement?**

7. **4. I feel confident judging when to inform others about a patient with challenging behaviour.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

8. **Do you have any suggestions for this statement?**

9. **5. I feel confident judging when to escalate a patient when the clinical picture is unclear.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

10. **Do you have any suggestions for this statement?**

11. **6. I feel confident that I haven't missed anything with a deteriorating patient.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

12. **Do you have any suggestions for this statement?**

13. **7. I feel confident knowing what to do when a patient is deteriorating.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

14. **Do you have any suggestions for this statement?**

15. **8. I feel confident talking with other members of the MDT about escalating a patient** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

16. **Do you have any suggestions for this statement?**

17. **9. I feel confident supporting a family member with challenging behaviour.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

18. **Do you have any suggestions for this statement?**

19. **10. I always ask for assistance when my workload increases unexpectedly.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

20. **Do you have any suggestions for this statement?**

21. **11. I am confident that there is backup/support available if I need it.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

22. **Do you have any suggestions for this statement?**

23. **12. I am aware when others in the team need help.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

24. **Do you have any suggestions for this statement?**

25. **13. I offer help when I know someone is busy.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

26. **Do you have any suggestions for this statement?**

27. **14. I know what to do if I don't get the response to escalation that I wanted.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

28. **Do you have any suggestions for this statement?**

29. **15. I feel confident escalating a patient earlier than the protocol suggests E.g NEWS <2** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

30. **Do you have any suggestions for this statement?**

31. **16. I am confident to tell other people in the team when I have concerns about a patient.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

32. **Do you have any suggestions for this statement?**

33. **17. I feel able to raise my concerns about a lack of communication between team members.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

34. **Do you have any suggestions for this statement?**

35. **18. I am aware how busy other zones are compared to mine.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

36. **Do you have any suggestions for this statement?**

37. **19. I feel confident delegating work to other team members.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

38. **Do you have any suggestions for this statement?**

39. **20. I work together with an RMN to support a patient with mental health needs.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

40. **Do you have any suggestions for this statement?**

41. **21. I feel confident supporting patients with mental health needs.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

42. **Do you have any suggestions for this statement?**

43. **22. I report broken equipment.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

44. **Do you have any suggestions for this statement?**

45. **23. I know when I need to adjust the way I work if there are bank/agency staff.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

46. **Do you have any suggestions for this statement?**

47. **24. I check the work of agency or bank staff.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

48. **Do you have any suggestions for this statement?**

49. **25. I know when it is appropriate to use the discharge lounge.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

50. **Do you have any suggestions for this statement?**

51. **26. I feel confident facilitating a complex discharge.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

52. **Do you have any suggestions for this statement?**

53. **27. I am aware of the progress of the work of MDT members in a complex discharge.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

54. **Do you have any suggestions for this statement?**

55. **28. I feel able to raise my concerns when discharging a patient home.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

56. **Do you have any suggestions for this statement?**

57. **29. I know how to use the pharmacy tracker for information about TTO's.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

58. **Do you have any suggestions for this statement?**

59. **30. I feel able to mentally keep track of what needs to be done without missing things.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

60. **Do you have any suggestions for this statement?**

61. **31. I feel confident to support new staff develop new skills.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

62. **Do you have any suggestions for this statement?**

63. **32. I get enough information to be able to prepare for new admissions from the ED.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

64. **Do you have any suggestions for this statement?**

65. **33. I get support from the team when de-escalating an aggressive patient.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

66. **Do you have any suggestions for this statement?**

67. **34. I get the opportunity to learn from observing how others deal with challenging patients.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

68. **Do you have any suggestions for this statement?**

69. **35. The team communicates effectively about how to support patients with challenging behaviour.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

70. **Do you have any suggestions for this statement?**

71. **36. As a team we discuss priorities as things change throughout the day.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

72. **Do you have any suggestions for this statement?**

73. **37. There is a lot of variability in how the nurses in charge work.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

74. **Do you have any suggestions for this statement?**

75. **38. There is a lot of variability in how the coordinators work.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

76. **Do you have any suggestions for this statement?**

77. **39. The team discusses how disruptions early in the shift are going to affect us later in the shift.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

78. **Do you have any suggestions for this statement?**

79. **40. Huddles help with awareness of the progress of patient care in the zone.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

80. **Do you have any suggestions for this statement?**

81. **41. The allocation of tasks is agreed within the team.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

82. **Do you have any suggestions for this statement?**

83. **42. I know when other zones have patients to be transferred to the same ward as mine.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

84. **Do you have any suggestions for this statement?**

85. **43. The discharge care plan is useful.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

86. **Do you have any suggestions for this statement?**

87. **44. All members of the MDT provide consistent information to patients about their discharge.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

88. **Do you have any suggestions for this statement?**

89. **45. All members of the team are aware of the discharge plan.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

90. **Do you have any suggestions for this statement?**

91. **46. The team effectively identifies when the workload on the next shift will be high and takes pre-emptive action.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

92. **Do you have any suggestions for this statement?**

93. **47. Everyone in the zone knows when there are new admissions coming in.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

94. **Do you have any suggestions for this statement?**

95. **48. It is difficult to escalate a patient who has just arrived from the ED.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

96. **Do you have any suggestions for this statement?**

97. **49. There is often a mismatch between the ED handover and the patient condition on admission.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

98. **Do you have any suggestions for this statement?**

99. **50. The team discusses when things have gone well, despite challenges.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

100. **Do you have any suggestions for this statement?**

101. **51. The information I receive from handover helps me to effectively care for a challenging patient.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

102. **Do you have any suggestions for this statement?**

103. **52. I am involved with discussions about patient care decisions.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

104. **Do you have any suggestions for this statement?**

105. **53. I am involved with discussions around assessing the capacity of a patient I am looking after.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

106. **Do you have any suggestions for this statement?**

107. **54. I feel included as a member of the healthcare team.** *
Mark only one oval.

	1	2	3	4	
Definitely don't include	◯	◯	◯	◯	Definitely include

108. **Do you have any suggestions for this statement?**

109. **Are there any other statements that you think should be part of the questionnaire?**

Appendix J. Questions Remaining After Review by Expert Group in Phase Two

(From 5.2.1.6Step Six – Send Questions to Expert Group for Review p.130)

1. I feel confident identifying the causes of challenging behaviour E.g. Delirium, Dementia, Mental health needs, Withdrawal.
2. I feel confident judging when to inform others about a patient with challenging behaviour.
3. I feel confident judging when to escalate a patient when the clinical picture is unclear.
4. I feel confident that I haven't missed anything with a deteriorating patient.
5. I feel confident knowing what to do when a patient is deteriorating.
6. I feel confident talking with other members of the MDT about escalating a patient.
7. I always ask for assistance when my workload increases unexpectedly.
8. I am confident that there is backup/support available if I need it.
9. I am aware when others in the team need help.
10. I offer help when I know someone is busy.
11. I know what to do if I don't get the response to escalation that I wanted.
12. I feel confident escalating a patient earlier than the protocol suggests E.g NEWS <2
13. I am confident to tell other people in the team when I have concerns about a patient.
14. I feel able to raise my concerns about a lack of communication between team members.
15. I am aware how busy other zones are compared to mine.
16. I work together with an RMN to support a patient with mental health needs.
17. I feel confident supporting patients with mental health needs.
18. I feel confident facilitating a complex discharge.
19. I am aware of the progress of the work of MDT members in a complex discharge.
20. I feel able to raise my concerns when discharging a patient home.
21. I feel confident to support new staff develop new skills.
22. I get enough information to be able to prepare for new admissions from the ED.
23. I get support from the team when de-escalating an aggressive patient.
24. As a team we discuss priorities as things change throughout the day.
25. The team discusses how disruptions early in the shift are going to affect us later in the shift.

26. Huddles help with awareness of the progress of patient care in the zone.

27. The allocation of tasks is agreed within the team.

28. I know when other zones have patients to be transferred to the same ward as mine.

29. The team effectively identifies when the workload on the next shift will be high and takes pre-emptive action.

30. Everyone in the zone knows when there are new admissions coming in.

31. It is difficult to escalate a patient who has just arrived from the ED.

32. There is often a mismatch between the ED handover and the patient condition on admission.

33. The team discusses when things have gone well, despite challenges.

34. The information I receive from handover helps me to effectively care for a challenging patient.

35. I am involved with discussions around assessing the capacity of a patient I am looking after.

36. I feel included as a member of the healthcare team.

Appendix K. Final Survey from Phase Two

(From 5.2.1.9 Step Nine – Pilot Testing, p.132)

Acute Medical Unit Survey

Welcome to the study. This questionnaire forms part of my PhD research project developing **a reflective process for analysing organisational resilience to improve the quality of care**. The research is being conducted by Matt Alders at the Centre for Applied Resilience in Healthcare (CARe). The questionnaire will enable us to gather information about how nursing staff feel about managing some of the challenging elements working on the Acute Medical Unit. We would greatly value your opinions.

All the information that you give us will be kept confidential. Your name will not appear on the questionnaire and any reports of the information will be completely anonymous so that your identity cannot be connected to specific answers you give.

There are 2 parts to this questionnaire. The first part involves 3 questions about your role. The second part involves 37 questions about your experiences managing the complex challenges on the Acute Medical Unit. The questionnaire should take about 10 minutes to complete. Please return completed questionnaires to the box labelled 'Acute Medical Unit Questionnaires' by the coordinator's desk or give them to Matt Alders in person.

Questions about your Role

1. What is your role on the Acute Medical Unit?

Please tick one box from the options below

- ❒ Healthcare Assistant
- ❒ Staff Nurse
- ❒ Senior Staff Nurse
- ❒ Junior Sister
- ❒ Deputy Ward Manager/ Ward Manager/ Matron

2. How long have you been qualified in your role?

Please tick one box from the options below

❒ Less than 1 year

❒ 1 year to 2 years

❒ 3 years to 4 years

❒ 5 years +

3. How long have you worked on the Acute Medical Unit?

Please tick one box from the options below

❒ Less than 1 year

❒ 1 year to 2 years

❒ 3 years to 4 years

❒ Since it opened

Please go to the next page for the second part of the questionnaire

Questions about your experiences working on the Acute Medical Unit

The 37 questions below relate to the work that you do on the Acute Medical Unit.

Please think about them in the context of how the ward operates.

Please rate *how well* you think these activities are done on the ward.

Please tick one box for each question

Questions	Poor	Fair	Good	Very Good	Excellent
1. Judging when to escalate a patient to more senior colleagues if the clinical picture is unclear	❒	❒	❒	❒	❒
2. Coordinating with the MDT to facilitate the complex discharge of a patient	❒	❒	❒	❒	❒
3. Communicating with all members of the nursing team about patient care during a shift	❒	❒	❒	❒	❒
4. Coordinating patient transfers across zones to the same destination	❒	❒	❒	❒	❒
5. Raising concerns about discharging a patient home if this is unsafe	❒	❒	❒	❒	❒
6. Involving team members in assessing a patient's mental capacity	❒	❒	❒	❒	❒
7. Identifying the causes of a patient's clinical deterioration	❒	❒	❒	❒	❒
8. Providing additional help if someone has too much to do	❒	❒	❒	❒	❒
9. Knowing what to do if the medical team's response to escalating a deteriorating patient isn't sufficient	❒	❒	❒	❒	❒

	Poor	Fair	Good	Very Good	Excellent
10. Informing team members when there are new admissions coming into the zone	❒	❒	❒	❒	❒
11. Changing staffing allocation during a shift in response to changed workloads	❒	❒	❒	❒	❒
12. Escalating a deteriorating patient to the MDT	❒	❒	❒	❒	❒
13. Knowing what to do when a patient is deteriorating	❒	❒	❒	❒	❒
14. Identifying the causes of challenging behaviour E.g. Delirium, dementia, withdrawal, etc.	❒	❒	❒	❒	❒
15. Communicating the learning from incident reports	❒	❒	❒	❒	❒
16. Communicating the learning from things that have gone well, despite challenges	❒	❒	❒	❒	❒
17. Changing practice in response to learning from things that have gone well	❒	❒	❒	❒	❒
18. Including RMN's during handover to support a patient with mental health needs	❒	❒	❒	❒	❒
19. Informing senior nursing colleagues when there are concerns about a patient	❒	❒	❒	❒	❒
20. Informing all members of the nursing team in a zone about a patient with challenging behaviour	❒	❒	❒	❒	❒
21. Taking action to reduce workload for the next shift	❒	❒	❒	❒	❒
22. Identifying when the workload on the next shift will be high	❒	❒	❒	❒	❒
23. Supporting staff to develop new skills	❒	❒	❒	❒	❒

	Poor	Fair	Good	Very Good	Excellent
24. Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team	❒	❒	❒	❒	❒
25. Supporting colleagues when responding to aggressive patients	❒	❒	❒	❒	❒
26. Reporting adverse incidents	❒	❒	❒	❒	❒
27. Changing practice in response to learning from incidents reports	❒	❒	❒	❒	❒
28. As a zone, adapting to changed priorities throughout the shift	❒	❒	❒	❒	❒
29. Agreeing the allocation of tasks between colleagues working in the same bay	❒	❒	❒	❒	❒
30. Supporting patients with mental health needs	❒	❒	❒	❒	❒
31. Handing over a patient with challenging behaviour to the next shift	❒	❒	❒	❒	❒
32. Knowing how busy other zones are compared to yours	❒	❒	❒	❒	❒
33. Having huddles to understand the workload of the zone	❒	❒	❒	❒	❒
34. Working effectively as a team	❒	❒	❒	❒	❒
35. Providing enough information to appropriately prepare for new admissions	❒	❒	❒	❒	❒
36. Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends	❒	❒	❒	❒	❒
37. Knowing when nursing colleagues in your zone need help	❒	❒	❒	❒	❒

Thank you very much for taking the time to complete this questionnaire.

Please return completed questionnaires to the **box labelled 'Acute Medical Unit Questionnaires'** by the coordinator's desk or **give them to Matt Alders in person**.

If this study has harmed you in any way or if you wish to make a complaint about the conduct of the study you can contact King's College London using the details below for further advice and information:

Dr. Janet Anderson
Florence Nightingale Faculty of Nursing and Midwifery
King's College London
James Clerk Maxwell Building
57 Waterloo Road
London
SE1 8WA
Office Telephone Number: 0207 848 3788
Email address: Janet.anderson@kcl.ac.uk

Alternatively, you can contact the King's College London Research Ethics office:

Research Ethics Office
Room 5.11 Franklin Wilkins Building
Waterloo Bridge Wing
Waterloo Road
London
SE1 9NH
Office Telephone Number: 020 7848 4077
Email address: pnm@kcl.ac.uk

Appendix L. Spearman's Rho correlation matrix for all survey items

	Questionnaire Items																																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1. Escalate senior colleague if unclear	-																																				
2. Coordinating MDT complex discharge	.348*	-																																			
3. Raising concerns safe discharge	0.23	0.26	-																																		
4. Escalating patient to MDT	.558**	0.22	0.22	-																		=	Small effect size (0.1)														
5. Knowing what to do response insufficient	.297*	.383**	.297*	.397**	-																	=	Medium effect size (0.3)														
6. Involving nursing assessing mental capacity	0.16	.339*	0.24	0.15	.467**	-																=	Large effect size (0.5)														
7. Identify cause clinical deterioration	.385**	.287*	0.16	.557**	.306*	.272*	-																														
8. Providing help	0.09	0.22	.268*	0.25	.312*	.407**	0.26	-													**Correlation is significant at the 0.01 level (2-tailed) *Correlation is significant at the 0.05 level (2-tailed)																
9. Changing allocation shift workload	0.19	.502**	0.26	0.27	.376**	.308*	.407**	.489**	-																												
10. Knowing what to do patient deteriorating	.495**	0.12	.293*	.712**	.514**	0.26	.517**	.315*	0.23	-																											
11. Identifying cause challenging behaviour	.399**	.294*	0.14	.500**	.443**	.373**	.613**	.379**	.521**	.481**	-																										
12. Including RMN handover	0.04	0.26	.363**	-0.06	0.24	.494**	0.06	-0.02	.277*	0.06	0.18	-																									
13. Informing colleagues concerns patient	.604**	0.15	0.21	.546**	0.26	.280*	.441**	.314*	.351*	.651**	.435**	0.15	-																								
14. Supporting colleagues aggressive patients	.370**	0.22	.349*	0.22	0.23	0.16	0.11	.437**	.365**	.342*	.306*	-0.06	.404**	-																							
15. Supporting patients mental health	0.10	0.24	.494**	0.10	.305*	.510**	0.18	0.22	0.24	.282*	0.17	.632**	0.25	0.18	-																						

16. Escalating patient just arrived ED	.387**	0.21	.444**	.554**	.539**	.293*	.437**	.307*	.354**	.718**	.422**	0.24	.496**	.394**	.347*	-																					
17. Handing over challenging patient	.289*	.315*	.343*	.335*	.336*	.288*	.425**	.412**	.460**	.426**	.437**	0.04	.485**	.463**	.282*	.541**	-																				
18. Escalating patient early	.383**	.330*	0.25	.463**	.442**	0.14	.462**	.503**	.484**	.434**	.488**	0.01	.432**	.494**	0.01	.585**	.596**	-																			
19. Communicating with nursing team patient care	0.23	.303*	0.22	0.19	.442**	.436**	.302*	.614**	.410**	.307*	.272*	0.16	.275*	0.24	.305*	.296*	.339*	.361**	-																		
20. Working effectively team	.275*	0.13	0.09	.431**	0.08	0.12	.361**	.518**	.403**	.405**	.536**	-0.04	.449**	.348**	0.07	.296*	.368**	.289*	.350**	-																	
21. Informing team challenging behaviour	.294*	0.26	.347*	0.23	0.23	.300*	0.25	0.18	0.24	.343*	.319*	.467**	.508**	.323*	.433**	.379**	.391**	.364**	.280*	0.19	-															
22. Development new skills	.486**	0.10	.291*	.348*	.370**	.437**	.273*	.498**	.368**	.466**	.394**	0.22	.502**	.495**	.336*	.443**	.301*	.288*	.437**	.632**	0.22	-														
23. Agreeing tasks colleagues bay	.288*	0.24	.278*	.306*	.369**	.422**	0.20	.487**	.365**	.346*	.353**	.370**	.359**	0.25	.303*	.346*	0.21	0.15	.415**	.455**	.273*	.608**	-													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
24. Knowing colleagues need help	.358**	0.17	.325*	.287*	.269*	.375**	.289*	.646**	.345*	.521**	.470**	0.10	.518**	.625**	.269*	.440**	.462**	.356**	.373**	.510**	.333*	.648**	.567**	-													
25. Discuss zone priorities	.281*	.354**	.449**	.419**	.475**	.360**	.429**	.302*	.523**	.572**	.358**	.361**	.467**	.335*	.334*	.685**	.559**	.507**	.276*	0.21	.436**	.400**	.413**	.381**	-												
26. Having huddles	.266*	0.24	0.18	0.17	0.14	.281*	0.20	.299*	.348*	0.22	.344*	0.22	0.14	.475**	0.27	0.14	0.18	0.23	.417**	.290*	.290*	.303*	.293*	.374**	0.16	-										
27. Knowing how busy other zones	0.00	.389**	0.25	0.02	0.24	.499**	0.15	.357**	.419**	0.19	.338*	.320*	0.08	.315*	.309*	.287*	0.27	0.15	.485**	0.10	0.24	0.16	.343*	.362**	.346**	.480**	-									
28. Coordinating transfers across zones	-0.04	0.26	.358**	0.00	0.23	.447**	0.18	.453**	.391**	0.08	0.05	.334*	0.19	0.08	.372**	0.19	.445**	0.25	.487**	0.12	.350*	0.17	0.24	0.15	.348**	0.23	.412**	-								
29. Informing team new admissions	0.10	0.09	.383**	0.23	.286*	0.23	.281*	.533**	.421**	.270*	.410**	0.15	0.15	.307*	0.20	.343*	0.23	.346*	.418**	.312*	0.17	0.24	.384**	.366**	0.13	.493**	.474**	.391**	-							
30. Communicating learning datix	0.04	.412**	.466**	0.16	.282*	.334*	0.15	0.14	.410**	0.24	0.25	.475**	0.17	0.20	.575**	.556**	.316*	0.20	.283*	0.07	.573**	0.14	.275*	0.22	.568**	0.20	.425**	.328*	0.23	-						
31. Communicating learning gone well	0.21	.342*	0.25	0.21	0.09	0.19	0.22	.341*	.479**	0.17	0.23	.329*	.428**	.269*	.306*	.282*	.332*	0.25	0.22	0.27	.606**	0.24	.359**	.326*	.424**	0.17	0.22	.438**	0.25	.558**	-					
32. Changing practice learning datix	0.10	.456**	0.24	0.18	0.25	.346*	.335*	.444**	.589**	0.15	.599**	0.25	0.19	.286*	.339*	.298*	.437**	.345*	.356**	.335*	.423**	0.15	0.25	.324*	.291*	.291*	.489**	.281*	.368**	.547**	.643**	-				

33. Changing practice learning gone well	.389**	.431**	0.21	.360**	.399**	.504**	.282*	.537**	.516**	.291*	.499**	.356**	.429**	.412**	.382**	.436**	.434**	.531**	.357**	.426**	.433**	.495**	.562**	.480**	.495**	0.23	.289*	0.22	0.24	.364**	.466**	.502**	-				
34. Reporting adverse incidents	.531**	.400**	0.09	.454**	.278*	0.14	.463**	.291*	.506**	.401**	.492**	0.02	.417**	.357**	0.12	.315*	.428**	.499**	.361**	.396**	.288*	.351**	0.10	.340*	.307*	.401**	0.23	0.09	0.22	0.12	.335*	.492**	.305*	-			
35. Identifying workload high shift	.273*	0.20	.424**	.490**	.392**	.294*	.412**	.395**	.410**	.719**	.497**	0.19	.535**	.405**	.376**	.691**	.581**	.460**	.362**	.431**	.371**	.472**	.416**	.510**	.661**	0.23	.450**	.340*	.430**	.444**	.296*	0.26	.354**	0.25	-		
36. Taking action reduce workload	0.20	.407**	.323*	.382**	.408**	.419**	.402**	.591**	.702**	.497**	.472**	0.18	.496**	.453**	0.23	.575**	.562**	.535**	.498**	.360**	.387**	.406**	.474**	.541**	.707**	.339*	.644**	.433**	.413**	.435**	.392**	.483**	.484**	.437**	.620**	-	
37. Right information new admissions	0.12	0.25	.334*	0.15	0.21	.293*	.361**	.313*	.390**	0.26	.496**	0.14	0.16	.360**	.270*	.423**	.446**	.428**	0.24	.291*	.306*	0.24	0.26	.384**	.311*	.343*	.341*	0.24	.507**	.448**	0.20	.470**	.307*	0.15	.363**	.402**	-

Appendix M. Information Sheet for Semi-Structured Interviews with Expert Group in Phase Three

(From 6.2.2 Data Collection, p.152)

Escalating a deteriorating patient to the multi-disciplinary team - 4.5

Knowing what to do when a patient is deteriorating - 4.37

Informing senior nursing colleagues when there are concerns about a patient - 4.33

Judging when to escalate a patient to more senior colleagues if the clinical picture is unclear - 4.22

Identifying the causes of challenging behaviour e.g. Delirium, dementia, withdrawal - 4.11

Appropriately escalating a deteriorating patient to a senior colleague earlier than the National Early Warning Score (NEWS) recommends - 4.09

Working effectively as a team - 4.07

Supporting colleagues when responding to aggressive patients - 4.06

Handing over a patient with challenging behaviour to the next shift - 4.06

Escalating deteriorating patients who have just arrived from the Emergency Department when they have not yet been seen by a medical team - 4.02

Identifying the causes of a patient's clinical deterioration - 3.96

Informing all members of the nursing team in a zone about a patient with challenging behaviour - 3.96

Raising concerns about discharging a patient home if this is unsafe - 3.94

Knowing what to do if the medical team's response to escalating a deteriorating patient is insufficient - 3.87

Supporting staff to develop new skills - 3.87

Coordinating with the multidisciplinary team to facilitate the complex discharge of a patient - 3.83

Communicating with all members of the nursing team about patient care during a shift - 3.8

Providing additional help if someone has too much to do - 3.6

Agreeing the allocation of tasks between colleagues working in the same bay - 3.56

Supporting patients with mental health needs - 3.31

Changing staffing allocation during a shift in response to changed workloads - 3.15

Involving nursing team members in assessing a patient's mental capacity - 3.07

Including registered mental health nurses (RMNs) during handover to support a patient with mental health needs - 2.59

Knowing when nursing colleagues in your zone need help - 3.8

As a zone, adapting to changed priorities throughout the shift - 3.71

Having huddles to understand the workload of the zone - 3.53

Informing team members when there are new admissions coming into the zone - 3.42

Coordinating patient transfers from different zones to the same destination - 3.02

Knowing how busy other zones are compared to yours - 2.96

Reporting adverse incidents e.g. patient fall, aggressive behaviour, medicine administration error - 4.02

Changing practice in response to learning from incident reports (Datix/IR1) - 3.72

Changing practice in response to learning from things that have gone well - 3.61

Communicating the learning from incident reports (Datix/IR1) - 3.57

Communicating the learning from things that have gone well, despite challenges - 3.57

Identifying when the workload on the next shift will be high - 4.02

Providing the right information to appropriately prepare for new admissions - 3.8

Taking action to reduce workload for the next shift - 3.56

Appendix N. AMU Management Survey

(From 6.2.2 Data Collection, p.152)

Questionnaire for AMU Management

Welcome to the study. This questionnaire forms part of a research project developing a reflective process for analysing organisational resilience to improve the quality of care. The research is being conducted by the Centre for Applied Resilience in Healthcare (CARe). The questionnaire will enable us to gather information about current safety and quality concerns for patient care on AMU. It will allow us to compare these concerns with the results of a different questionnaire exploring how nursing staff feel about managing some of the challenging elements of the work on AMU. As managers on AMU, we believe that you have the best understanding of the current safety and quality concerns. We would greatly value your opinions.

All the information that you give us will be kept confidential. Your name will not appear on the questionnaire and any reports of the information will be completely anonymous so that your identity cannot be connected to specific answers you give.

The questionnaire should take about ten minutes to complete. When you have finished please return this to Matt Alders or the box by the coordinator's desk labelled 'Matt's PhD Project'.

Many thanks for your time

Please answer the questions below by writing in the space provided. There is space to write up to three quality or safety concerns. Please write what you feel is important and what you are most concerned about. It is not necessary to complete all three concerns.

1st Quality and/or safety concern

A. Please describe your concern.

B. How do you know this is a problem?

C. What steps have been taken/planned to address this?

2nd Quality and/or safety concern

A. Please describe your concern.

B. How do you know this is a problem?

C. What steps have been taken/planned to address this?

3rd Quality and/or safety concern

A. Please describe your concern

B. How do you know this is a problem?

C. What steps have been taken/planned to address this?